Houston ISD ATeaMS

Multiplying and Dividing Fractions

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Educated Solutions

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Multiplying Fractions

Solve each problem below. Draw a model to represent your solution process.

Problem	Model	Solution
John's father made 12 cupcakes for John's birthday party. Two-thirds of the cupcakes had chocolate icing. How many cupcakes had chocolate icing?		
At the party, each of the 12 children in attendance was served $\frac{2}{3}$ cup of punch. How much punch was served in all?		

How are the problems alike?

How are the problems different?

How are the picture models alike?

How are the picture models different?

Use **paper models** to solve each of the following problems.

Problem Situation: Three-fifths of a pizza was covered with jalapeños. If Stacy ate $\frac{3}{4}$ of the jalapeño slices, what fraction of a whole pizza did she eat?	
Picture Model	
Numerical Expression	**Solution**

Problem Situation: One pizza pan had $\frac{3}{4}$ of a pepperoni pizza left in it. Josue ate $\frac{5}{8}$ of the pizza left in the pan. What fraction of a whole pizza did Josue eat?	
Picture Model	
Numerical Expression	**Solution**

Problem Situation: There were $1\frac{1}{2}$ pizzas left after the party. John's father ate $\frac{3}{4}$ of the leftovers for a midnight snack. What fraction of a whole pizza did John's father eat?	
Picture Model	
Numerical Expression	**Solution**

Use **centimeter cubes** or **Cuisenaire rods** to solve each of the following problems.

Problem Situation: Before the children sang "Happy Birthday", John had opened $\frac{1}{5}$ of his presents. Immediately after the song, he opened $\frac{1}{2}$ of the remaining presents. What fraction of his total presents did he open immediately after the song?	
Picture Model	
Numerical Expression	**Solution**

Problem Situation: John's birthday cake was cut into 25 equal pieces. John was served 1 piece of cake. John's guests ate $\frac{2}{3}$ of the remaining pieces. What fraction of the whole birthday cake did John's guests eat?

Picture Model

Numerical Expression	Solution

Problem Situation: Each serving of punch is $\frac{2}{3}$ cup. If Maria drank $3\frac{1}{2}$ servings, how many cups of punch did she drink in all?

Picture Model

Numerical Expression	Solution

Dividing Fractions

Solve each problem below. Draw a model to represent your solution process.

Problem	Model	Solution
A chef has 20 cups of flour. Each cake requires 4 cups of flour. How many cakes can the chef make?		
A total of 20 candles are arranged on 4 birthday cakes. How many candles are on each cake?		

How are the two problems similar?

How are the two problems different?

Division by Grouping, Part 1

Use a ruler to model each of the following and complete the table.

1. Start with 12 inches.
2. Find how many groups of a given size can be found in 12 inches.
3. The solution is the number of groups.

Start with: (inches)	Size of groups: (inches)	Pictorial Representation	Solution (number of groups)
12	6		
12	4		
12	3		
12	2		
12	1		
12	$\frac{1}{2}$		
12	$\frac{1}{4}$		
12	$\frac{3}{4}$		

What is the relationship between the solutions to $12 \div \frac{1}{4}$ and $12 \div \frac{3}{4}$? Why is this?

Based on observations in the table, find the answers to the following problems without using a ruler.

$12 \div \frac{1}{5} =$ $12 \div \frac{1}{10} =$ $12 \div \frac{1}{12} =$

Based on your observations, explain how to find the solution to $6 \div \frac{1}{4}$.

How can you use the solution to $6 \div \frac{1}{4}$ to find the solution to $6 \div 1\frac{1}{4}$?

Using the procedure developed above, explain in words how to find the solution to $8 \div 1\frac{2}{3}$.

Division by Sharing

Use centimeter cubes to model each of the following and complete the table.

1. Start with the given number of cubes.
2. Divide the cubes into the required number of groups.
3. The solution is the size of one group.

Start with:	Number of groups:	Pictorial Representation	Solution (size of 1 group)
12	3		
12	2		
12	$1\frac{1}{2}$		
12	1		
12	$\frac{3}{4}$		
12	$\frac{2}{3}$		
12	$\frac{1}{2}$		
12	$\frac{3}{7}$		

Explain how to use centimeter cubes to find the solution to $8 \div \frac{4}{5}$.

Based on the procedure developed above, find the solution to each problem.

$16 \div \frac{4}{5} =$ $6 \div \frac{3}{8} =$ $9 \div 1\frac{1}{2} =$

What is the relationship between the solutions to $12 \div \frac{1}{2}$ and $12 \div 1\frac{1}{2}$? Why is this?

Explain in words how to find the solution to $15 \div 1\frac{1}{2}$ by using the procedure developed in this activity.

Analysis of a 5E Lesson

Subject/Lesson: _____ Objective: _____

Stage of 5E Lesson	Teacher Role	Student Role	Suggestions
Engage *Gets the students' minds focused on the topic.*			
Explore *Provides students with a common experience.*			
Explain *Teaches the concept with interaction between the teacher and students.*			
Elaborate *Provides opportunity for students to apply the concept in a new situation.*			
Evaluate *Allows students to demonstrate understanding of the concept and facts.*			

Questioning and the 5E Lesson

Subject/Lesson: _____ Objective: _____

Stage of 5E Lesson	Question	Bloom's Level
Engage *Gets the students' minds focused on the topic.*		○ Remember ○ Understand ○ Apply ○ Analyze ○ Evaluate ○ Create
Explore *Provides students with a common experience.*		○ Remember ○ Understand ○ Apply ○ Analyze ○ Evaluate ○ Create
Explain *Teaches the concept with interaction between the teacher and students.*		○ Remember ○ Understand ○ Apply ○ Analyze ○ Evaluate ○ Create
Elaborate *Provides opportunity for students to apply the concept in a new situation.*		○ Remember ○ Understand ○ Apply ○ Analyze ○ Evaluate ○ Create
Evaluate *Allows students to demonstrate understanding of the concept and facts.*		○ Remember ○ Understand ○ Apply ○ Analyze ○ Evaluate ○ Create

Start - Stop - Continue

As a result of today's experiences, what actions do you need to start, stop, or continue in order to support student success in mathematics?

Start:

Stop:

Continue:

Peanut Butter Fudge

TEKS

6.1A Number, operations, and quantitative reasoning. The student represents and uses rational numbers in a variety of equivalent forms. The student is expected to compare and order non-negative rational numbers.

6.1B Number, operations, and quantitative reasoning. The student represents and uses rational numbers in a variety of equivalent forms. The student is expected to generate equivalent forms of rational numbers including whole numbers, fractions, and decimals.

6.3B Patterns, relationships, and algebraic thinking. The student solves problems involving direct proportional relationships. The student is expected to represent ratios and percents with concrete models, fractions, and decimals.

6.11A Underlying processes and mathematical tools. The student applies Grade 6 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics.

6.12A Underlying processes and mathematical tools. The student communicates about Grade 6 mathematics through informal and mathematical language, representations, and models. The student is expected to communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

6.13A Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to make conjectures from patterns or sets of examples and nonexamples.

6.13B Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to validate his/her conclusions using mathematical properties and relationships.

Materials

Advance preparation:

- **Fudge Pieces** – 1 per group of 3 – 4 students
- **More Fudge-y-Ness Cards** – 1 set per group of 3 – 4 students

For each group of 3 – 4 students:

- Base-ten blocks – 1 set

For each student:

- Scissors
- **Decimal Models**
- **Peanut Butter Fudge**
- **More Fudge-y-Ness**
- **Candy Bar Leftovers** and selected response items

Engage

The Engage portion of the lesson is designed to create student interest in the concepts addressed and make connections to past and present learning. This part of the lesson is designed for groups of three to four students.

1. Distribute a set of base-ten blocks to each group of students.
2. Provide a copy of **Decimal Models** to each student.
3. Prompt groups to use the base-ten blocks to model each situation and complete **Decimal Models**.
4. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Engage Phase

- Which of the base-ten piece represents tenths? Hundredths? A whole?
  The bar represents tenths. The unit pieces represent hundredths. The flat represents one whole.
- What digit is in the tenths place?
  Responses may vary. Possible response: 3, 4, 0
- How would you model 0.3 using the base-ten blocks?
  Three bars
- What digit is in the hundredths place?
  Responses may vary. Possible response: 5, 8, 0
- How would you model 0.05 using the base-ten blocks?
  Five unit pieces
- How could you use the models to order the decimals from least to greatest?
  Responses may vary. Possible response: by looking for the model that used the greatest number of unit pieces
- When comparing decimals, what does the symbol < mean? The symbol >?
  Less than, greater than

Explore

The Explore portion of the lesson provides the student with an opportunity to be actively involved in the exploration of the mathematical concepts addressed. This part of the lesson is designed for groups of three to four students.

1. Distribute a copy of **Fudge Pieces** to each group of students.
2. Provide a pair of scissors and a copy of **Peanut Butter Fudge** to each student.
3. Prompt students to cut out each piece of peanut butter fudge in the set.
4. Once the **Fudge Pieces** have been cut out, prompt students to use the **Fudge Pieces** and base-ten blocks to complete the table on **Peanut Butter Fudge**. At this time, students should not complete the shaded row of the table.
5. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Explore Phase

- What do you observe when using the fudge piece to cover the base-ten flat?
  Responses may vary. Possible response: Each piece of the fudge covers different amounts of the base-ten flat.
- What type of manipulation could you do to the fudge piece to cover the base-ten flat?
  Responses may vary. Possible response: The fudge piece can be turned around or cut it into smaller parts.
- How many of that fudge piece covered the base-ten flat?
  Responses may vary. (See Peanut Butter Fudge answer key.)
- How can you use the number of times the fudge piece fit on the base-ten flat to determine the fractional part of the flat covered by the piece of fudge?
  Responses may vary. Possible response: The fractional part would be 1 out of how many times the piece would need to be repeated to cover the whole base-ten flat. For example: if it took 5 of the pieces (each piece the same size) to cover the base-ten flat then the fractional part of the base-ten flat would be 1 out of 5, or $\frac{1}{5}$.
- How can using the base-ten flat help you determine how many hundredths your piece of fudge covers?
  Responses may vary. Possible response: Since the base-ten flat is made up of 100 unit pieces, the number of units the fudge piece covers will determine its value in hundredths. For example, if the piece of fudge covers 20 hundredths, then its value would be 0.20.

Explain

The Explain portion of the lesson is directed by the teacher to allow the students to formalize their understanding of the TEKS addressed in the lesson. Use the Facilitation Questions to prompt student groups to share their responses.

1. Debrief **Peanut Butter Fudge**.
2. Use the Facilitation Questions to lead the discussion.

Facilitation Questions – Explain Phase

Debriefing Peanut Butter Fudge

- What fractional part of the whole is covered by piece A? B? C? D?
  $\frac{1}{10}, \frac{1}{5}, \frac{1}{4}, \frac{1}{20}$

Facilitation Questions – Explain Phase (continued)

- How did you determine what fractional part of the whole is covered by piece A? B? C? D?
  Responses may vary. Possible response: I repeated the piece until the base-ten flat was completely covered to determine how many pieces made up the base-ten flat. Since, the piece covered the base-ten block 10 times, I knew that the piece of fudge represented $\frac{1}{10}$ *of the base-ten flat.*
- How many hundredths are covered by piece A? B? C? D?
  10, 20, 25, 5
- How did you determine the number of hundredths to shade for piece A?
  Responses may vary. Possible response: I placed the piece on the 100-grid and counted the number of hundredths the piece covered.
- What decimal part of the base-ten flat is covered by piece A? B? C? D?
  0.10, 0.20, 0.25, 0.05
- How does the number of hundredths covered relate to your decimal?
  Responses may vary. Possible response: Since there are 100 squares, I knew each square was equivalent to one-hundredth. Therefore 10 squares are equivalent to 0.10.
- What is the fraction you wrote from the decimal for piece A? B? C? D?
  $\frac{10}{100}, \frac{20}{100}, \frac{25}{100}, \frac{5}{100}$
- How did you write the fraction from your decimal?
  Responses may vary. Possible response: I could write the fraction by using place value. For example: The fraction $\frac{10}{100}$ *is read ten-hundredths; therefore, using place value as a decimal it would be written 0.10 or 0.1.*
- How is this fraction different from the fraction that represents the fractional part of the base-ten flat? How are they the same?
  Responses may vary. Possible response: They have different numerators and denominators. The fractions are equivalent.

<u>Connecting to Percents</u>

- What does percent mean?
  Responses may vary. Possible response: how many out of 100
- What would be 100% of the base-ten flat? How do you know?
  100 squares
- What would be 50% of the base-ten flat? How do you know?
  50 squares
- A 100-grid is often used to model percents, why do you think this is?
  Responses may vary. Possible response: The 100-grid is made up of 100 equal parts.
- Thinking of the base-ten flat as a 100-grid, what percent represents fudge piece A? B? C? D? How do you know?
  10%, 20%, 25%, 5%

Facilitation Questions – Explain Phase (continued)

- What is the relationship between the fraction where the denominator is 100 and the percent?
  Responses may vary. Possible response: The percent is the numerator.
- What is the relationship between the decimal value and the percent?
  Responses may vary. Possible response: The percent is the decimal times 100. (Demonstrate the relationship by multiplying each decimal by 100.)
- What is the relationship between the fraction in simplest form and the percent?
  Responses may vary. Possible response: If the fraction were rewritten with a denominator of 100, then that would give you the percent.
- How would you express 2% as a decimal?
  0.02
- How would you express 2% as a fraction in simplest form?
  $\frac{1}{50}$
- What would the model of 2% look like? Why?
  Responses may vary. Possible response: 100-grid with 2 squares shaded
- What would the percents be for the shaded row of **Peanut Butter Fudge**?
  10%, 20%, 25%, 5%

Order and Compare

- Which fudge piece has the greatest value? How do you know?
  C
- Which fudge piece has the smallest value? How do you know?
  D
- What would be the order of the pieces if you order them from greatest to least?
  C, B, A, D
- How would you order 26%, 0.75, and $\frac{7}{20}$ from least to greatest?

  26%, $\frac{7}{20}$, 0.75

Elaborate

The Elaborate portion of the lesson provides an opportunity for the student to apply the concepts of the TEKS within a new situation. In this lesson, students will generate and compare non-unit fractions, decimals, and percents. This part of the lesson is designed for groups of three to four students.

1. Distribute a set of **More Fudge-y-Ness Cards** to each group of students.
2. Provide a copy of **More Fudge-y-Ness** to each student.
3. Prompt students to work together to complete **More Fudge-y-Ness**.
4. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Elaborate Phase

- How could you rewrite the fraction as a percent?
  Write an equivalent fraction where the denominator is 100.
- How could you use the model to write a fraction?
  Responses may vary. Possible response: I would count the number of shaded squares, and then write a fraction that represents the number shaded out of 100.
- What type of model could be used to represent percents?
  Responses may vary. Possible response: 100-grid
- How could you use the model to determine the percent?
  Responses may vary. Possible response: Since percents are based out of 100, I would count the number of shaded squares and write the percent. For example: 22 shaded squares are 22%.
- How could you write a decimal as a fraction?
  Use the place value as the denominator of the fraction.

Evaluate

The Evaluate portion of the lesson provides the student with an opportunity to demonstrate his or her understanding of the TEKS addressed in the lesson.

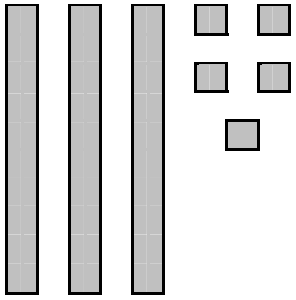
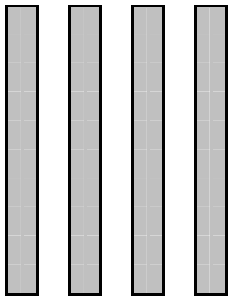
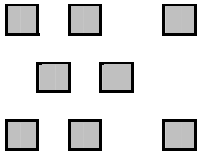
1. Provide each student with **Candy Bar Leftovers**.
2. Upon completion of the activity sheet, a rubric should be used to assess student understanding of the concepts addressed in the lesson.

Answers and Error Analysis for selected response questions:

Question Number	TEKS	Correct Answer	Conceptual Error	Conceptual Error	Procedural Error	Procedural Error	Guess
1	6.3B	D	A	B			C
2	6.3B	A	B	C			D
3	6.3B	C	A	B			D
4	6.3B	C	A	B	D		

Decimal Models (Answer Key)

1. Model each of the decimals using the base-ten blocks.

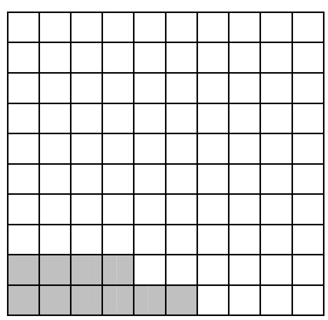
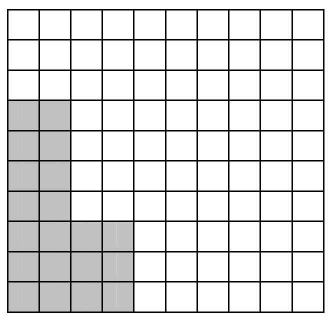
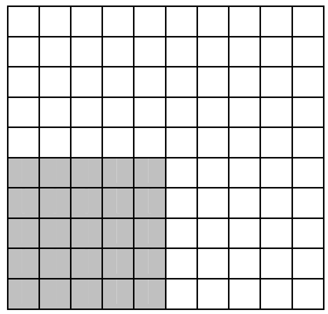
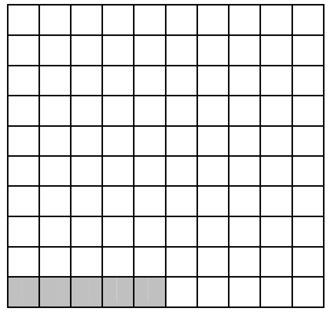
Decimal	Sketch the model.
0.35	
0.4	
0.08	

2. Order the decimals from least to greatest. How can you use the models to help you order the decimals?
   0.08, 0.35, 0.4
   Responses may vary. Possible response: Line up each model end to end to see which is the shortest. That is the decimal with the least value. Continue this process to order the decimals.

3. Fill in the blanks using the decimals modeled above to make true statements.
   Responses may vary. Possible response:
   a. *0.35* > *0.08*
   b. *0.35* < *0.4*

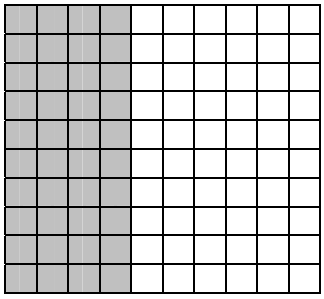
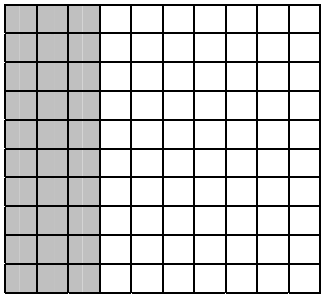
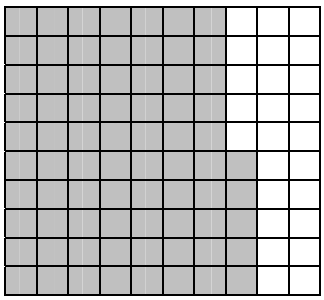
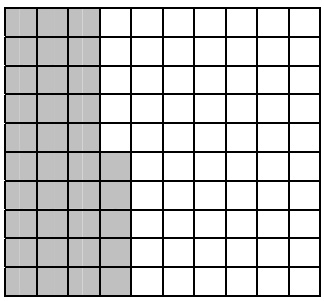
Peanut Butter Fudge (Answer Key)

Complete the un-shaded portion of the table using the pieces of fudge and base-ten blocks.

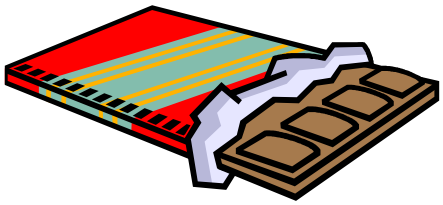
	A	B	C	D
How many pieces of the peanut butter fudge will fit on the base-ten flat?	*10*	*5*	*4*	*20*
What fractional part of the whole is covered by your piece of peanut butter fudge?	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{20}$
Shade your fractional part of the base-ten flat.				
How many hundredths is your piece of peanut butter fudge?	*10*	*20*	*25*	*5*
Write the number of hundredths as a ratio out of 100.	$\frac{10}{100}$	$\frac{20}{100}$	$\frac{25}{100}$	$\frac{5}{100}$
What percent is this?	*10%*	*20%*	*25%*	*5%*

More Fudge-y-Ness (Answer Key)

Complete the table below.

	Model	Fraction	Decimal	Percent
JAMES		$\frac{2}{5}$ or $\frac{40}{100}$	0.4	40%
JOHN		$\frac{3}{10}$ or $\frac{30}{100}$	0.3	30%
JOEL		$\frac{3}{4}$ or $\frac{75}{100}$	0.75	75%
JAKE		$\frac{7}{20}$ or $\frac{35}{100}$	0.35	35%

Candy Bar Leftovers (Answer Key)



Kim, Sue, Nancy and Terri each bought a king size chocolate bar. The table below shows the amount of candy bar each girl did NOT eat.

Candy Bar Leftovers

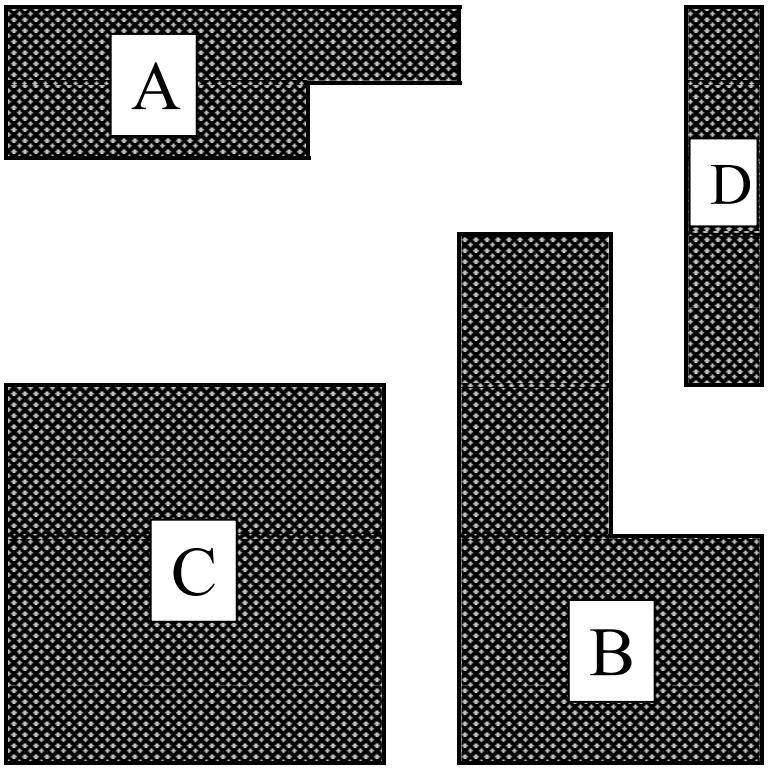
Kim	20%
Nancy	$\frac{1}{4}$
Terri	$\frac{6}{25}$
Sue	0.23

Who ate the most of their chocolate bar? Justify your answer.

Kim

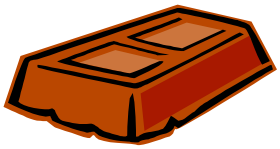
Fudge Pieces

1 set – cut along the perimeter of each fudge piece.



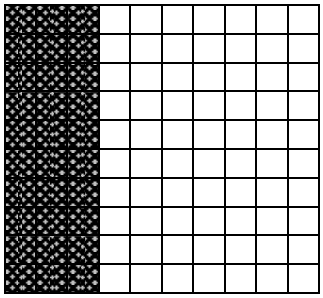
More Fudge-y-Ness Cards

1 set – Cut along dotted lines.

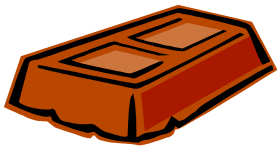


James ate $\frac{2}{5}$ of the mint fudge. What decimal represents the fraction of mint fudge James ate?

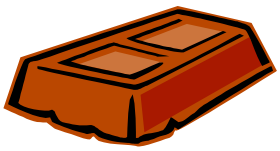
John ate a part of the chocolate chip fudge. He created the model shown below to represent the amount of chocolate chip fudge he ate.



What fraction in simplest form represents the amount of chocolate chip fudge John ate?



Jake ate 35% of the white chocolate fudge. Create a model to represent the amount of white chocolate fudge Jake ate.



Joel ate 0.75 of the caramel fudge. What fraction with a denominator of 100 represents the amount of caramel fudge Joel ate?

Decimal Models

1. Model each of the decimals using the base-ten blocks.

Decimal	Sketch the model.
0.35	
0.4	
0.08	

2. Order the decimals from least to greatest. How can you use the models to help you order the decimals?

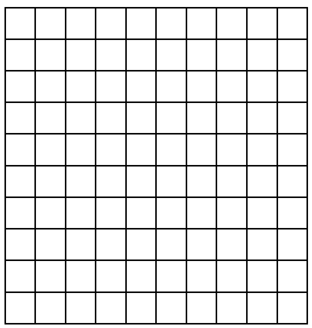
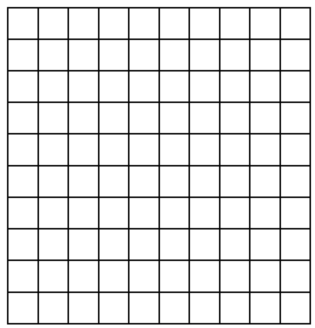
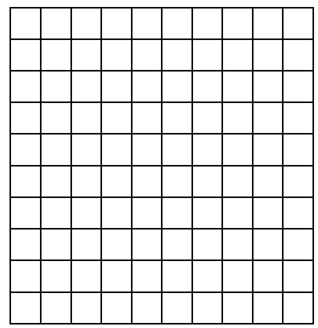
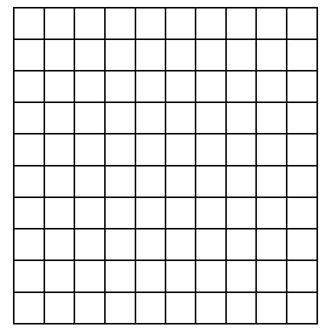
3. Fill in the blanks using the decimals modeled above to make true statements.

   a. ☐ > ☐

   b. ☐ < ☐

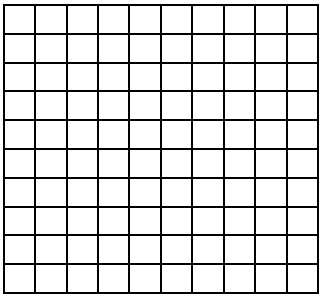
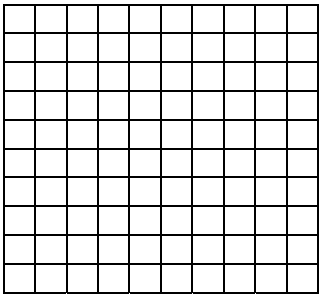
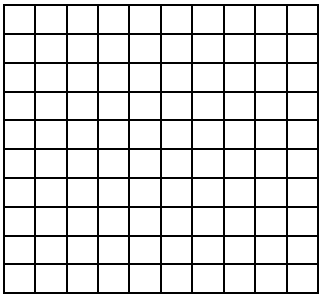
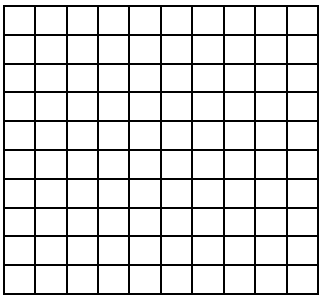
Peanut Butter Fudge

Complete the un-shaded portion of the table using the pieces of fudge and base-ten blocks.

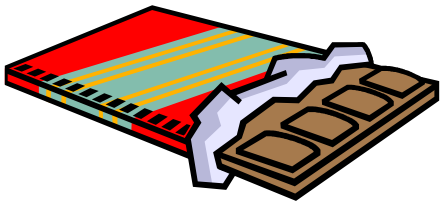
	A	B	C	D
How many pieces of the peanut butter fudge will fit on the base-ten flat?				
What fractional part of the whole is covered by your piece of peanut butter fudge?				
Shade your fractional part of the base-ten flat.				
How many hundredths is your piece of peanut butter fudge?				
Write the number of hundredths as a ratio out of 100.				
What percent is this?				

More Fudge-y-Ness

Complete the table below.

	Model	Fraction	Decimal	Percent
JAMES				
JOHN				
JOEL				
JAKE				

Candy Bar Leftovers



Kim, Sue, Nancy and Terri each bought a king size chocolate bar. The table below shows the amount of candy bar each girl did NOT eat.

Candy Bar Leftovers

Kim	20%
Nancy	$\frac{1}{4}$
Terri	$\frac{6}{25}$
Sue	0.23

Who ate the most of their chocolate bar? Justify your answer.

1 What percent is represented by the shaded region of the model shown below?

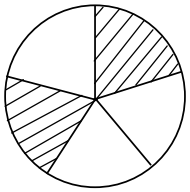
A 3%

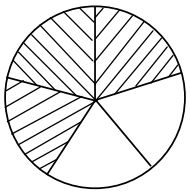
B 20%

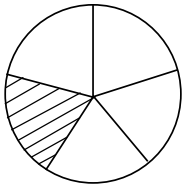
C 35%

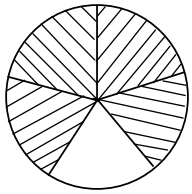
D 60%

2 Each circle below is divided into sections of equal size. Which circle has 40% of its total area shaded?

A 

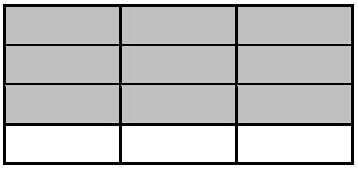
B 

C 

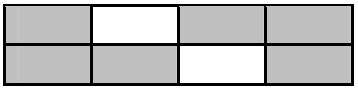
D 

3 Martie created a model of 75%. Which of the models below does NOT represent a shaded portion of 75%?

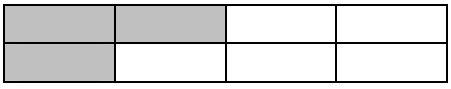
A 

B 

C 

D 

4 Pedro created the model below.



What percent is represented by the shaded region of the model?

A $12\frac{1}{2}\%$

B 25%

C $37\frac{1}{2}\%$

D $62\frac{1}{2}\%$

Tick-Tock

TEKS

6.2C The student adds, subtracts, multiplies, and divides to solve problems and justify solutions. The student is expected to use multiplication and division of whole numbers to solve problems involving equivalent ratios and rates.

6.1B The student represents and uses rational numbers in a variety of equivalent forms. The student is expected to generate equivalent forms of rational numbers including whole numbers, fractions, and decimals.

6.3C The student solves problems involving direct proportional relationships. The student is expected to use ratios to make predictions in proportional situations.

6.7 The student uses coordinate geometry to identify location in two dimensions. The student is expected to locate and name points on a coordinate plane using ordered pairs of non-negative rational numbers.

6.8D The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles. The student is expected to convert measures within the same measurement system (customary and metric) based on relationships between units.

6.11A The student applies Grade 6 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics.

6.12A The student communicates about Grade 6 mathematics through informal and mathematical language, representations, and models. The student is expected to communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

6.13A The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to make conjectures from patterns or sets of examples and nonexamples.

6.13B The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to validate his/her conclusions using mathematical properties and relationships.

Materials

Advance preparation:

- Clock with a second hand or a stop watch
- **Transparency: Clock**

For each group of 3 – 4 students:

- Centimeter Cubes – approximately 50 cubes per group

For each student:

- **How Many "A's"?**
- **Clock**
- **Larry's Laps Around the Track**
- **Lucy's Laps**
- **Jogging with Jana** and selected response items

Engage

The Engage portion of the lesson is designed to generate student interest in the concepts addressed and make connections to past and present learning. This part of the lesson is designed for individual investigation.

1. Distribute **How Many "A's"?** to each student.
2. Prompt students to read the directions on **How Many "A's"?**. Students may write the "A's" on the back of **How Many "A's"?**.
3. The teacher should prompt students to begin writing and then prompt them to stop after 15 seconds have passed. The teacher should use a stop-watch or a clock with a second hand to time the 15 seconds.
4. Prompt students to record the number of "A's" they were able to write in the appropriate place in the table.
5. Prompt students to switch hands, and repeat this process.
6. Prompt students to again record the number of "A's" they were able to write in the appropriate place in the table.
7. Prompt students to use their recorded data to complete **How Many "A's"?**. Students may work with a partner and assist each other as necessary.
8. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Engage Phase

- How could you use the first row of your table to find out the number of "A's" you could write in 30 seconds?
  Responses may vary. Possible response: Since 30 seconds is twice as much time as 15 seconds, I should be able to write twice as many "A's" in 30 seconds.
- Do you think the numbers in your table are reasonable? Why or why not?
  Responses may vary. Possible response: I don't think I could really write that many "A's" because I think my hand would start to get tired and I would slow down and then have to stop writing.
- What part of the table do you think might be helpful in predicting the number of "A's" you could write in 5 minutes? Why?
  Responses may vary. Possible response: I think it would be easiest to use the 60 second row because that tells me the number of "A's" written in 1 minute. Then I can just multiply by 5 to find the number of "A's" written in 5 minutes.

Facilitation Questions – Engage Phase (continued)

- How can you write the time in minutes?
  Since there are 60 seconds in 1 minute, I can write a fraction showing the number of seconds that have passed out of 60. Then I can simplify that fraction.

Explore

The Explore portion of the lesson provides the student with an opportunity to be actively involved in the exploration of the mathematical concepts addressed. This part of the lesson is designed for groups of three to four students.

1. Distribute centimeter cubes to each group.
2. Distribute a **Clock** and **Larry's Laps Around the Track** to each student.
3. Prompt students to use the centimeter cubes and the **Clock** to complete **Larry's Laps Around the Track**.
4. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Explore Phase

- Where could you place the centimeter cubes on the clock to model that Larry can walk 4 laps in 15 minutes?
  Responses may vary. Possible response: I know that 15 minutes is the same as one-fourth of an hour, so I can place 4 centimeter cubes in one-fourth of the clock to show that Larry walked 4 laps in one-fourth of an hour.
- How would you model the laps that Larry can walk in 45 minutes?
  Responses may vary. Possible response: I would repeat the number of laps that Larry walked in 15 minutes 3 times because 45 minutes is the same as 3 groups of 15 minutes.
- How could you determine the number of laps Larry would be able to walk if the amount of time that had passed was more than 60 minutes?
  Responses may vary. Possible response: I could use 2 or more clocks to build a model for that amount of time.
- Where is an elapsed time of 15 minutes represented on your graph?
  Responses may vary. Possible response: Since the time is represented in hours, I have to know that 15 minutes is one-fourth of an hour, and 15 minutes would be one-fourth of the distance from 0 to 1 on the x-axis.
- How can you use your graph to determine the number of laps Larry can walk in 150 minutes?
  Responses may vary. Possible response: I would have to figure out that 150 minutes is the same as $2\frac{1}{2}$ *hours. Then I could follow the trend of my graph to see that Larry would have walked 40 laps in* $2\frac{1}{2}$ *hours.*

Explain

The Explain portion of the lesson is directed by the teacher to allow the students to formalize their understanding of the TEKS addressed in the lesson.

1. Debrief **Larry's Laps Around the Track**.
2. Use the Facilitation Questions to lead the discussion. The teacher may choose to use centimeter cubes and **Transparency: Clock** to model during the discussion.

Facilitation Questions – Explain Phase

- How did you determine the number of laps Larry had walked to complete your table?
  Responses may vary. Possible response: I know that 15 minutes is the same as one-fourth of an hour, so I can place 4 centimeter cubes in one-fourth of the clock to show that Larry walked 4 miles in one-fourth of an hour. Then I just repeated groups of 4 centimeter cubes for each 15 minutes as many times as I needed to for the given time.
- How did you determine the number of laps Larry had walked in 150 minutes?
  Responses may vary. Possible response: I know that 150 minutes is the same as 5 times 30 minutes. So I multiplied 8 times 5 to get 40 laps.
- Did you use your graph or your table to answer question #3? Why?
  Responses may vary. Possible response: I chose to use the graph because I thought it was really easy to find 2 hours on the x-axis and then follow that gridline up to see how many laps Larry would have walked. I did the same for 3 hours.
- How did you determine the length of time it would take for Larry to walk 28 laps?
  Responses may vary. Possible response: I knew from my table that it would have to be more than 1 hour because I could see that Larry only walked 16 laps in 1 hour. Then I looked at my graph, and I found 28 laps on the y-axis and followed that gridline across to see how long it would take Larry to walk those laps. The point was three-fourths of the way between the 1 and the 2 on the x-axis, so I knew that it was 1 and three-fourths hours, which is the same as 1 hour and 45 minutes.

Elaborate

The Elaborate portion of the lesson provides an opportunity for the student to apply the concepts of the TEKS within a new situation. This part of the lesson is designed for groups of three to four students.

1. Distribute centimeter cubes to each group.
2. Distribute **Lucy's Laps** to each student.
3. Prompt students to work cooperatively with their groups to complete **Lucy's Laps**.
4. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Elaborate Phase

- How is **Lucy's Laps** similar to **Larry's Laps**? How is it different?
  Responses may vary. Possible response: Both Lucy and Larry are going around the track, and I have to build a table and a graph for both. They are going at different rates.
- How can you determine the number of laps Lucy has run in 15 minutes?
  Responses may vary. Possible response: I know that there are 3 groups of 15 in 45. So I split the 36 laps into 3 equal groups.
- How can you determine the number of laps Lucy has run in 10 minutes?
  Responses may vary. Possible response: I can find the number of laps that Lucy has run in 5 minutes, and then double it to find the number of laps in 10 minutes.
- How can you graph the number of laps Lucy has run in 5 minutes?
  Responses may vary. Possible response: My graph has one hour split into fourths. So I know that each gridline on the x-axis represents one-fourth of an hour, or 15 minutes. Since 5 minutes is one-third of 15 minutes, I have to find the place that is one-third of the distance from 0 to one-fourth on the x-axis.
- How can you find the length of time it will take Lucy to run 24 laps?
  Responses may vary. Possible response: I can find the 24 on the y-axis and follow the gridline across to see that it will take half of an hour, or 30 minutes to run the 24 laps.

Evaluate

The Evaluate portion of the lesson provides the student with an opportunity to demonstrate his or her understanding of the TEKS addressed in the lesson.

1. Provide each student with **Jogging with Jana** and the selected response items.
2. Upon completion of the activity sheet, a rubric should be used to assess student understanding of the concepts addressed in the lesson.

Answers and Error Analysis for selected response questions:

Question Number	TEKS	Correct Answer	Conceptual Error	Conceptual Error	Procedural Error	Procedural Error	Guess
1	6.2C	D	A	C			B
2	6.2C	C	B	D	A		
3	6.2C	B	C	D			A
4	6.2C	C	B	D	A		

How Many "A's"? (Answer Key)

Possible Responses

1. Your teacher is going to time you for 15 seconds. Your job is to write the printed, capital letter "A" as many times as you can during that 15 seconds. Record the total number of "A's" you were able to write in the appropriate place in the table below.

2. Switch hands, and repeat this process. Again, record the number of "A's" you were able to write in the table below.

3. Use the data you recorded to complete the rest of the table.

Time (in seconds)	Time (in minutes)	Number of "A's" written by RIGHT Hand	Number of "A's" written by LEFT Hand
15	$\frac{15}{60} = \frac{1}{4}$	*20*	*13*
30	$\frac{30}{60} = \frac{1}{2}$	*40*	*26*
45	$\frac{45}{60} = \frac{3}{4}$	*60*	*39*
60	*1*	*80*	*52*
75	$\frac{75}{60} = 1\frac{1}{4}$	*100*	*65*
90	$\frac{90}{60} = 1\frac{1}{2}$	*120*	*78*
105	$\frac{105}{60} = 1\frac{3}{4}$	*140*	*91*
120	*2*	*160*	*104*

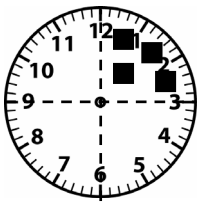
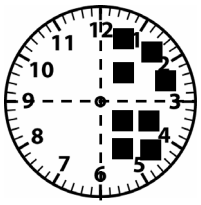
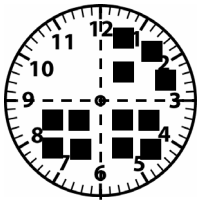
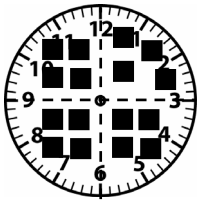
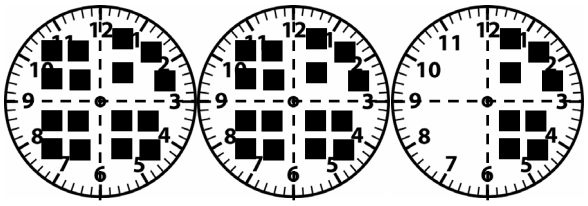
4. What patterns do you see in the table?
   Responses may vary. Possible responses: The right-hand column increases by 20. The left-hand column increases by 13. The number of A's written by my left hand is always less than my right hand because I am right-handed. The number of A's I was able to write in 2 minutes is double the number of A's I was able to write in 1 minute.

5. How many "A's" do you think you could write with your right hand in 5 minutes? Justify your prediction.
   Responses may vary. Possible response: If I could keep up the pace, I should be able to write 400 A's in 5 minutes because if can write 80 in 1 minute, then 80 times 5 is 400. I don't really think this is reasonable though because I think my hand would get tired, and I wouldn't really be able to write that many.

Larry's Laps Around the Track (Answer Key)

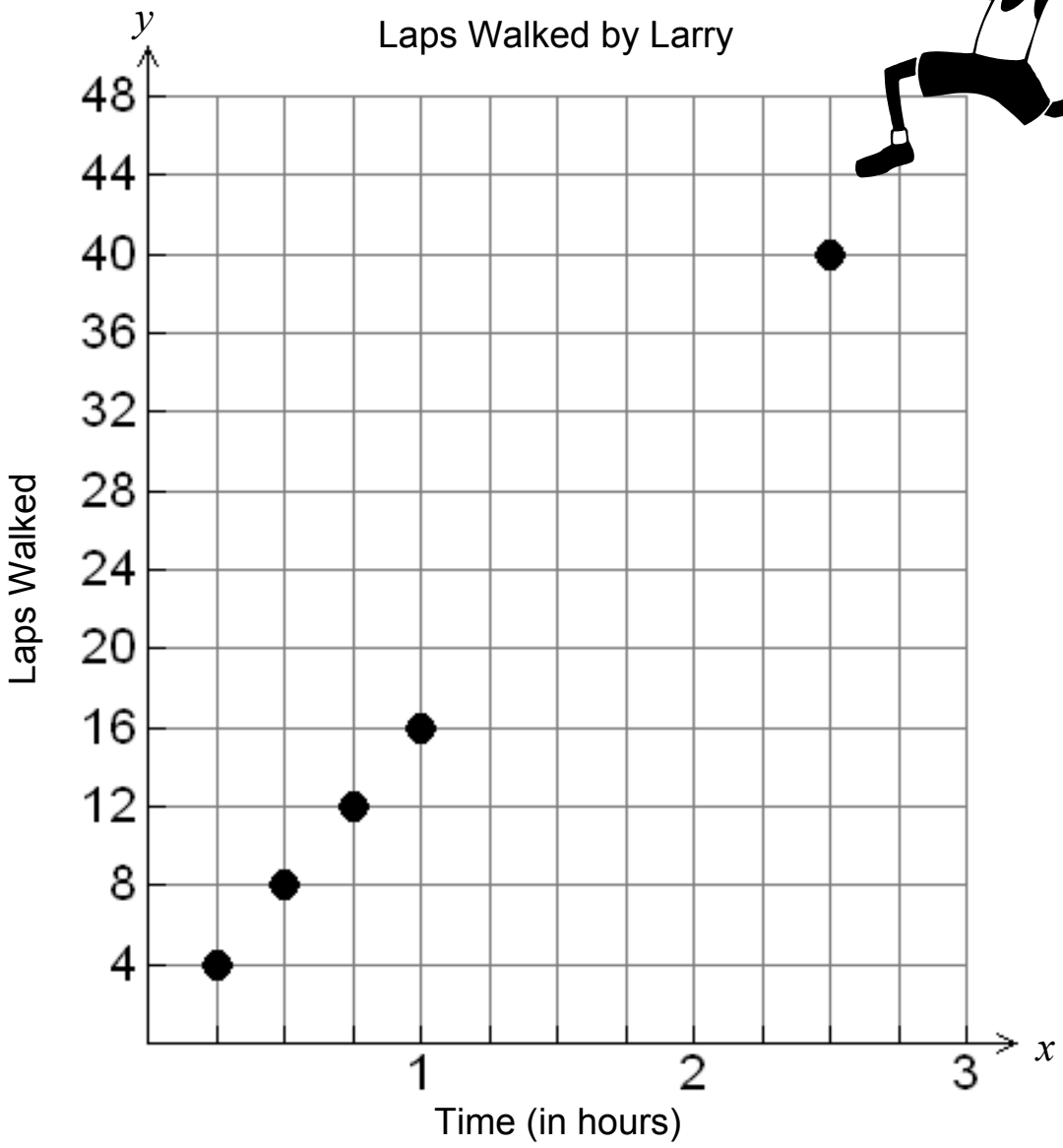
Larry is able to walk 4 laps around the track in 15 minutes.

1. Use the centimeter cubes and the **Clock** to model the number of laps Larry would be able to walk in 1 hour. Record your models in the table below.

Time (in minutes)	Time (in hours)	Model ***Possible Responses***	Number of Laps Walked
15	$\frac{1}{4}$		*4*
30	$\frac{1}{2}$		*8*
45	$\frac{3}{4}$		*12*
60	*1*		*16*
150	$2\frac{1}{2}$		*40*

Larry's Laps Around the Track (Answer Key)

2. Use the data from your table to graph the laps that Larry walks.



3. Use your table and/or your graph to answer each of the following questions:

   a) How many laps would Larry have walked in 2 hours?
   Larry would have walked 32 laps in 2 hours.

   b) How many laps would Larry have walked in 3 hours?
   Larry would have walked 48 laps in 3 hours.

   c) How long would it take Larry to walk 28 laps?
   It would take Larry 1 hour and 45 minutes (or $1\frac{3}{4}$ hours) to walk 28 laps.

Lucy's Laps (Answer Key)

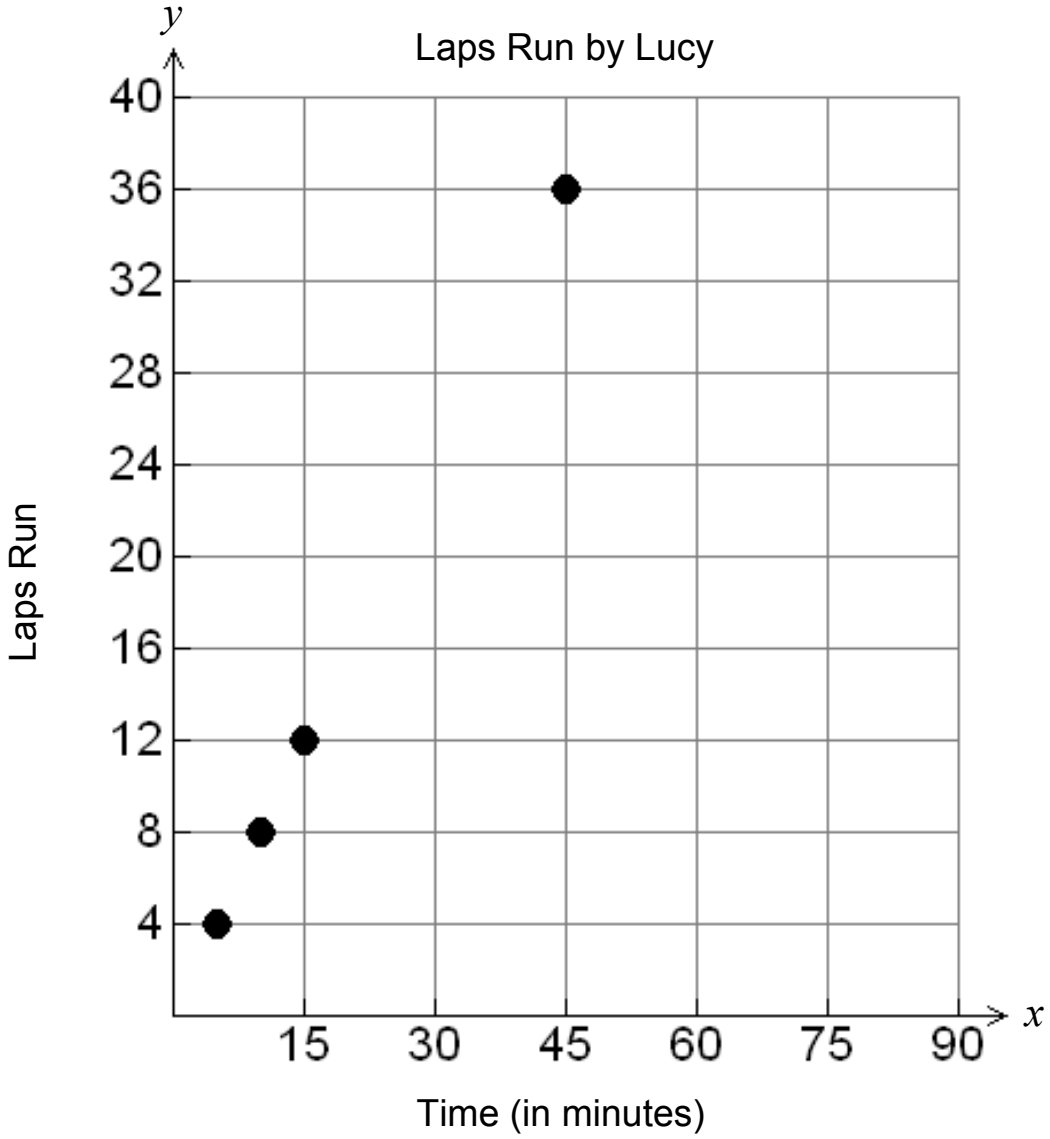
Larry's sister Lucy is on the track team and is able to run 36 laps in 45 minutes.

1. Complete the table below.

Time (in minutes)	Time (in hours)	Process ***Possible Answers***	Number of Laps Run
5	$\frac{1}{12}$	$45 \div 9 = 5$ $36 \div 9 = 4$	*4*
10	$\frac{1}{6}$	$5 \times 2 = 10$ $4 \times 2 = 8$	*8*
15	$\frac{1}{4}$	$45 \div 3 = 15$ $36 \div 3 = 12$	*12*
45	$\frac{3}{4}$		*36*
80	$1\frac{1}{3}$	$10 \times 8 = 80$ $8 \times 8 = 64$	*64*

Lucy's Laps (Answer Key)

2. Use the data from your table to graph the laps that Lucy runs.



3. Use your table and/or your graph to answer each of the following questions:

   a) How many laps would Lucy have run in 1 hour?
   Lucy would have run 48 laps in 1 hour.

   b) How many laps would Lucy have run in 3 hours?
   Lucy would have run 144 laps in 3 hours.

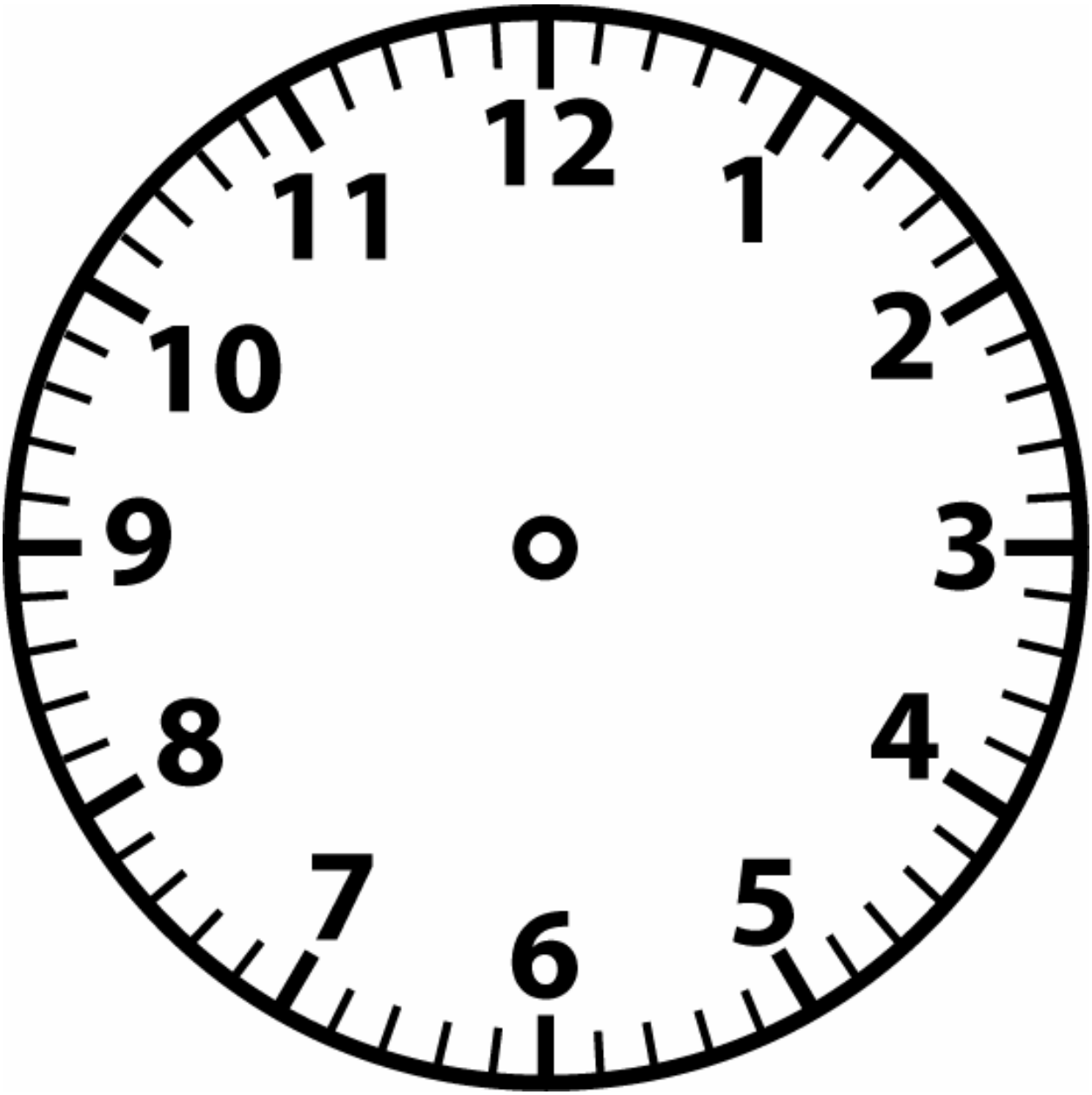
   c) How long would it take Lucy to run 24 laps?
   It would take Lucy 30 minutes (or $\frac{1}{2}$ hour) to run 24 laps.

Jogging with Jana (Answer Key)

Jana goes jogging with Lucy and Larry. During the first hour, she is able to jog 6 laps every 15 minutes. During the second hour, Jana slows down a little bit as she is getting tired, and is only able to jog 5 laps every 20 minutes. How many laps did Jana jog in these 2 hours? Justify your answer.

Jana jogged 39 laps in these 2 hours.

Transparency: Clock



How Many "A's"?

1. Your teacher is going to time you for 15 seconds. Your job is to write the printed, capital letter "A" as many times as you can during that 15 seconds. Record the total number of "A's" you were able to write in the appropriate place in the table below.

2. Switch hands, and repeat this process. Again, record the number of "A's" you were able to write in the table below.

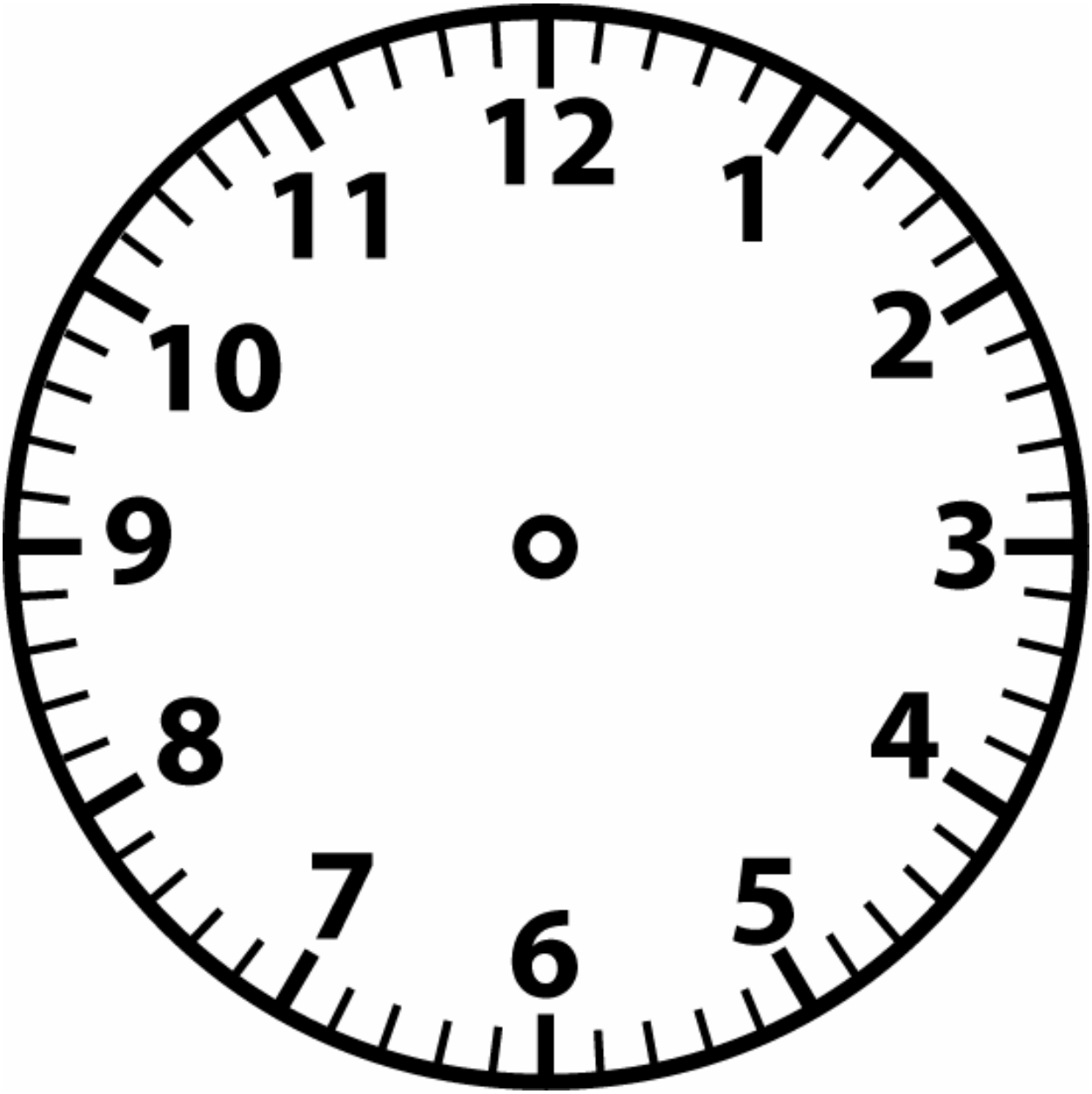
3. Use the data you recorded to complete the rest of the table.

Time (in seconds)	Time (in minutes)	Number of "A's" written by RIGHT Hand	Number of "A's" written by LEFT Hand
15			
30			
45			
60			
75			
90			
105			
120			

4. What patterns do you see in the table?

5. How many "A's" do you think you could write with your right hand in 5 minutes? Justify your prediction.

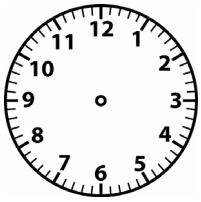
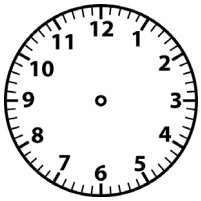
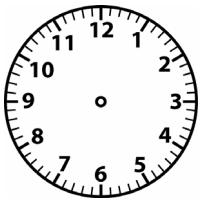
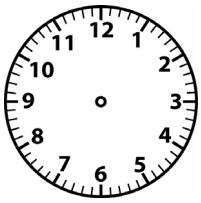
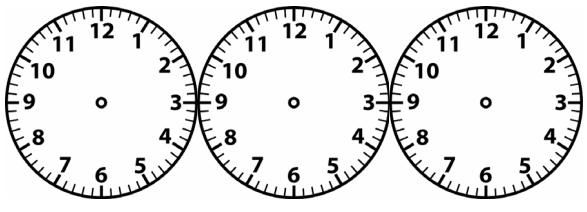
Clock



Larry's Laps Around the Track

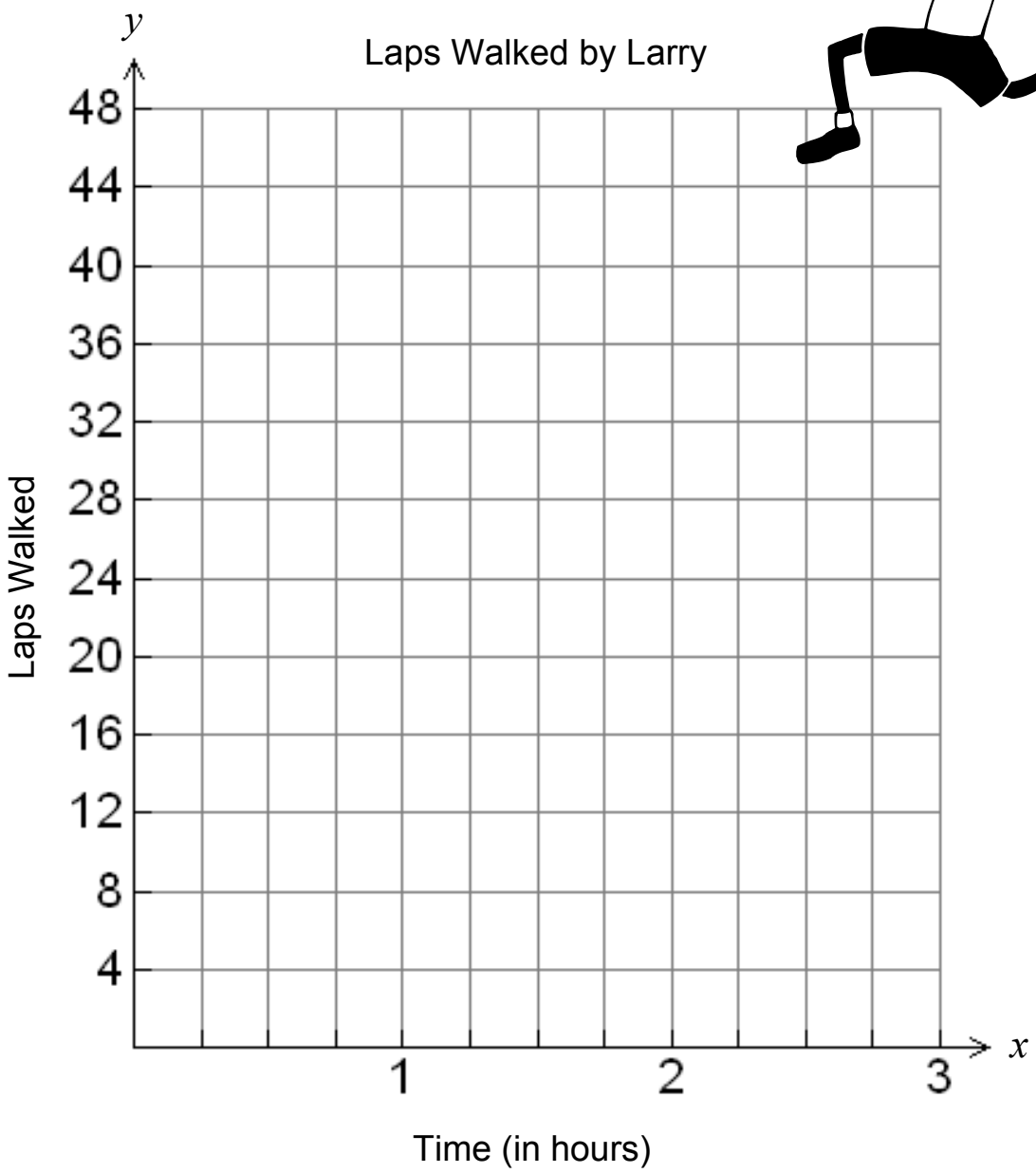
Larry is able to walk 4 laps around the track in 15 minutes.

1. Use the centimeter cubes and the **Clock** to model the number of laps Larry would be able to walk in 1 hour. Record your models in the table below.

Time (in minutes)	Time (in hours)	Model	Number of Laps Walked
15			
30			
45			
60			
150			

Larry's Laps Around the Track

2. Use the data from your table to graph the laps that Larry walks.



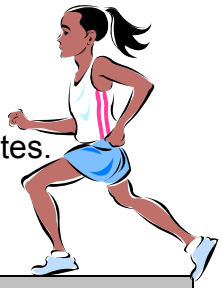
3. Use your table and/or your graph to answer each of the following questions:

   a) How many laps would Larry have walked in 2 hours?

   b) How many laps would Larry have walked in 3 hours?

   c) How long would it take Larry to walk 28 laps?

Lucy's Laps



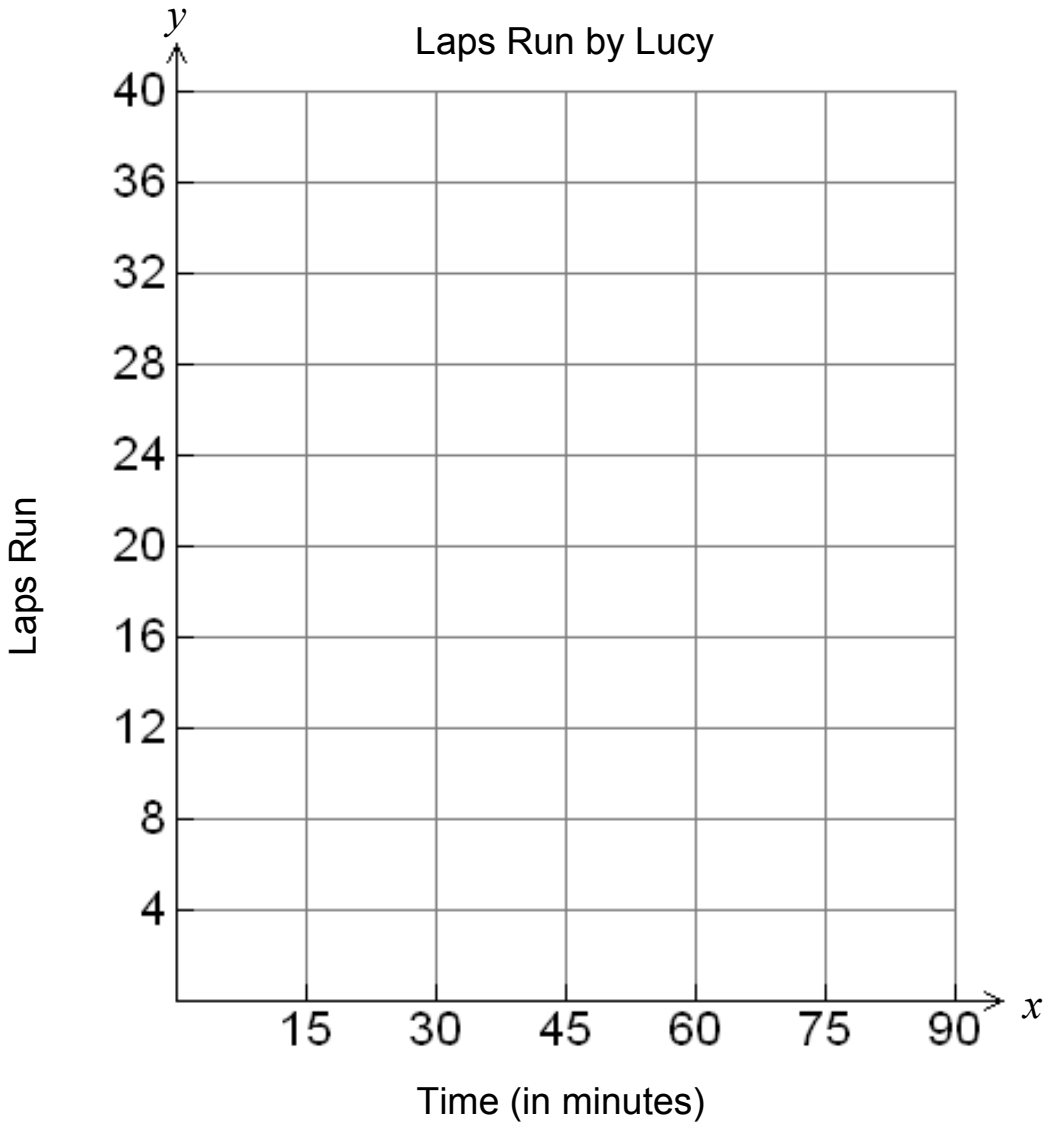
Larry's sister Lucy is on the track team and is able to run 36 laps in 45 minutes.

1. Complete the table below.

Time (in minutes)	Time (in hours)	Process	Number of Laps Run
5			
10			
15			
45			
80			

Lucy's Laps

2. Use the data from your table to graph the laps that Lucy runs.



3. Use your table and/or your graph to answer each of the following questions:

   a) How many laps would Lucy have run in 1 hour?

   b) How many laps would Lucy have run in 3 hours?

   c) How long would it take Lucy to run 24 laps?

Jogging with Jana

Jana goes jogging with Lucy and Larry. During the first hour, she is able to jog 6 laps every 15 minutes. During the second hour, Jana slows down a little bit as she is getting tired, and is only able to jog 5 laps every 20 minutes. How many laps did Jana jog in those 2 hours? Justify your answer.

1 Sabrina was able to type 190 words in 5 minutes. If she maintains the same rate, how many words will she be able to type in 30 minutes?

A 150

B 340

C 950

D 1,140

2 Lyla ordered 6 large cheese pizzas for a party. Her total cost, with no tax, was $54.00. What would be the cost of 3 large cheese pizzas?

A $9.00

B $18.00

C $27.00

D $51.00

3 A racecar travels at an average speed of 220 miles per hour. At this speed, the front tires rotate at a rate of 43 times per second. At the same speed, how many times will a front tire rotate in 1 minute?

A 103

B 2,580

C 9,460

D 13,200

4 Dominick works at a car wash. Yesterday he worked an 8 hour shift and washed 56 cars. If he washed the same number of cars each hour, how many cars had he washed in 3 hours?

A 7

B 18

C 21

D 24

Super Model-ing

TEKS

7.1B Number, operations, and quantitative reasoning. The student represents and uses numbers in a variety of equivalent forms. The student is expected to convert between fractions, decimals, whole numbers, and percents mentally, on paper, or with a calculator.

7.1A Number, operations, and quantitative reasoning. The student represents and uses numbers in a variety of equivalent forms. The student is expected to compare and order integers and positive rational numbers.

7.2F Number, operations, and quantitative reasoning. The student adds, subtracts, multiplies, or divides to solve problems and justify solutions. The student is expected to select and use appropriate operations to solve problems and justify the selections.

7.3A Patterns, relationships, and algebraic thinking. The student solves problems involving direct proportional relationships. The student is expected to estimate and find solutions to application problems involving percent.

7.13C Underlying processes and mathematical tools. The student applies Grade 7 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.

7.15A Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to make conjectures from patterns or sets of examples and nonexamples.

Materials

Advance preparation:

- **Transparency: 100-Grid**

For each student group of 3 - 4 students:

- Base ten blocks
- Scissors
- **Pieces of Candy Bars** - 1 per group
- Colored Pencils
- Centimeter Cubes
- **Making Models –** 1 set of 3 problems per group

For each student:

- **Traveling Around**
- **100-Grids**
- **Devon's Doughnut Dilemma** and selected response items

Engage

The Engage portion of the lesson is designed to generate student interest in the concept of equivalence and percents. This part of the lesson is designed for groups of three to four students.

1. Distribute base ten blocks, scissors and **Pieces of Candy Bars** to each group.
2. Prompt students to follow the directions on the activity sheet to complete **Pieces of Candy Bars**.
3. Debrief the activity using the Facilitation Questions.

Facilitation Questions – Engage Phase

- How did you determine the size of each piece?
  Responses may vary. Possible response: I put the piece on top of a flat and counted how many units were covered.
- How did you write the size of each piece as a fraction? Decimal? Percent?
  Responses may vary. Possible response for piece C: Since I know that a flat is made up of 100 units, I knew that my fraction would be the number of units covered by my piece out of 100. Since my piece covered 28 pieces, I wrote the fraction $\frac{28}{100}$.

  I know that a flat is the same as a hundredths grid, where each unit represents one-hundredth. So I could write the decimal representation by using what I know about place values as twenty-eight hundredths, or 0.28.

  I also know that percent is out of 100, so since I already know that I have 28 pieces out of 100 total pieces, I knew that I had 28% of a candy bar.
- Which fraction is the largest? How do the models support this?
  Responses may vary. Possible response: $\frac{60}{100}$ *or* $\frac{3}{5}$ *is the largest fraction. I can see this in the models because Piece D is the largest piece, and it represents* $\frac{3}{5}$ *of the whole candy bar.*
- Which decimal is the smallest? How do the models support this?
  Responses may vary. Possible response: Piece A is the smallest of the 4 pieces, and it represents only 4 of the hundredths. So 0.04 is the smallest decimal.

Explore

The Explore portion of the lesson provides the student with an opportunity to be actively involved in the exploration of the mathematical concepts addressed. This part of the lesson is designed for groups of three to four students.

1. Distribute colored pencils, centimeter cubes and **Making Models** sheets to each group.
2. Prompt students to follow the directions on the activity sheets to complete all 3 models. Students may choose to model each situation with the centimeter cubes and then use the provided 100-grid to record the model.

3. The teacher should actively monitor student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Explore Phase

- How could you use the centimeter cubes to represent a box of lollipops?
  Responses may vary. Possible response: I could use 3 yellow cubes and 1 red cube.
- How could you use the cubes to represent 100 lollipops?
  Responses may vary. Possible response: I could build "boxes" of lollipops with 3 yellow and 1 red over and over again until I get to 100 lollipops.
- How do you simplify a fraction?
  I can divide the numerator and denominator by their greatest common factor.
- How can you use the centimeter cubes to model the rabbits in the pet store?
  Responses may vary. Possible response: I can use 1 red cube with two other colored cubes to show that 1 out of 3 has floppy ears.
- What would you do with the leftover square when you model the percent of rabbits with floppy ears?
  Responses may vary. Possible answer: I can get to 99 rabbits, where 33 of them have floppy ears, but then I still have one rabbit leftover to get to 100. So I would divide the last square into 3 equal parts and colored one of them red. Then $33\frac{1}{3}$ *squares would be colored red on my grid.*
- How could you represent the floppy-eared rabbits on your 100-grid?
  Responses may vary. Possible response: I can divide the last square into 3 equal parts and color one of them red.
- How could you use the 100-grid to represent the cupcakes that Marty ate?
  Responses may vary. Possible response: I need to color $4\frac{1}{2}$ *squares out of every 5 squares on the grid.*

Explain

The Explain portion of the lesson is directed by the teacher to allow the students to formalize their understanding of the TEKS addressed in the lesson.

1. Debrief **Making Models**.
2. Use the Facilitation Questions to lead the discussion. The teacher may choose to use **Transparency: 100-Grid** to clarify concepts during the discussion.

Facilitation Questions – Explain Phase

- How many lollipops out of 100 are red? How many are yellow?
  25 out of 100 are red, and 75 out of 100 are yellow.
- How did you represent these numbers in fraction form?
  $\frac{25}{100}$ *and* $\frac{75}{100}$
- What fraction represents the number of lollipops that are red or yellow out of 100?
  $\frac{100}{100}$ *because ALL of the lollipops are red or yellow.*
- What is the relationship between the fraction out of 100 and the fraction in simplest form?
  Responses may vary. Possible response: They are equivalent fractions.
- How did you represent the floppy-eared rabbits on your 100-grid?
  Responses may vary. Possible response: I could get to 99 rabbits, where 33 of them have floppy ears, but then I still had one rabbit leftover to get to 100. So I divided the last square into 3 equal parts and colored one of them red. Then I had $33\frac{1}{3}$ *squares colored red on my grid.*
- How did you use the 100-grid to represent the cupcakes that Marty ate?
  Responses may vary. Possible response: I colored $4\frac{1}{2}$ *out of every 5 squares on the grid. Then when I was finished, I grouped my halves together to make whole squares out of them. Then I counted the number of whole squares that were colored and there were 90 of them.*
- What is the relationship between the fraction representing the number of cupcakes that Marty ate $\left(\frac{4.5}{5}\right)$ and the other two fractions in the table?
  Responses may vary. Possible response: They are all equivalent fractions. I can multiply the numerator and the denominator of the original fraction, $\frac{4.5}{5}$*, by 2 to get* $\frac{9}{10}$*. Then I can multiply the numerator and denominator by 10 to get* $\frac{90}{100}$.
- What is the relationship(s) between the fractions and the percent numbers in the tables?
  Responses may vary. Possible response: They are equivalent. Since percent is a number out of 100, it was really easy to get the percent number from the grid because I just had to count the number of colored squares out of the 100 squares in the grid. This is also the reason that my percent numbers always matched the numerator when I wrote the fractions out of 100.

Facilitation Questions – Explain Phase (continued)

- How could you write $\frac{3}{8}$ as a percent? As a decimal?

  Responses may vary. Possible response: I could color 3 out of every 8 squares on a 100-grid to see how many would be colored out of 100. I would color 36 squares but I would have 4 squares leftover. Since I need 8 parts, I would divide each of those last 4 squares in half and then color 3 of those 8 halves. Then I could see that I have $37\frac{1}{2}$ *squares colored out of 100 squares. This would tell me that* $\frac{3}{8}$ *is the same as* $37\frac{1}{2}\%$ *which could also be written as 37.5%. To get the decimal number, I just have to remember my place value, and since I know that I have 37.5 squares colored out of 100, that's the same as 37.5 hundredths, or 0.375.*

Elaborate

The Elaborate portion of the lesson provides an opportunity for the student to apply the concepts of the TEKS within a new situation. This part of the lesson is designed for groups of two students.

1. Distribute **Traveling Around** and **100-Grids** to each student.
2. Prompt students to follow the directions on **Traveling Around**. Students may choose to use the **100-Grids** to help them find solutions to the problems on **Traveling Around.**
3. Each student will take his or her worksheet to another student. Each pair of students will need to agree to work the same problem on each other's paper and to sign their names in the appropriate spaces. *(This will insure that each student works every problem, and it will also allow students to check their answers.)*
4. Upon completion of one problem, each student will then choose another partner and follow the same procedure described in step 3.
5. Continue this process until all of the problems are completed.
6. Prompt students to return to their seats when every problem has been completed.
7. Prompt students to check the work on their papers and make any necessary modifications.
8. The teacher should actively monitor student work and ask Facilitation Questions when appropriate.

Facilitation Questions – Elaborate Phase

- How could you use the 100-grid to help solve the vacation problem?
  Responses may vary. Possible response: I can color five out of every eight squares, and then divide up the leftover squares into halves so that I have 8 equal parts. Then I could color 5 of those 8 halves.

Facilitation Questions – Elaborate Phase (continued)

- What are you being asked to find in the bird problem? How can a model help you find a solution?
  Responses may vary. Possible response: I need to figure out 60% of 5 birds. I could use a 100-grid and color 60 of the 100 squares to show 60%. Then I could see that 6 out of each row of 10 squares was colored, so 60% is the same as 6 out of 10, which is the same as 3 out of 5.
- How can you find 30% of 250 people in the movie theater?
  Responses may vary. Possible response: I can simplify 30% to $\frac{3}{10}$ *and then multiply by a scale factor of 25 to get* $\frac{75}{250}$. *This would represent the 75 people out of 250 people in the movie theater that would be expected to purchase candy.*

Evaluate

The Evaluate portion of the lesson provides the student with an opportunity to demonstrate his or her understanding of the TEKS addressed in the lesson.

1. Provide each student with **Devon's Doughnut Dilemma**.
2. Upon students' completion of the activity, a rubric should be used to assess student understanding of the concepts addressed in the lesson.

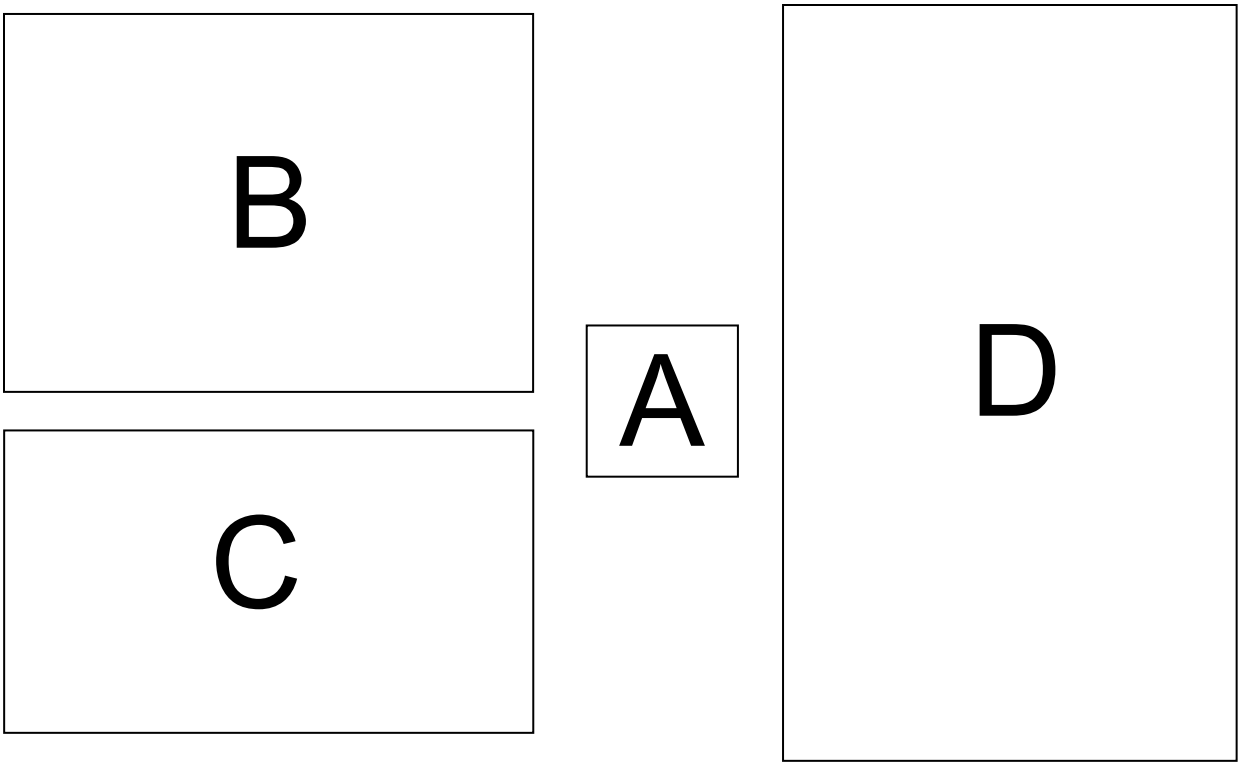
Answers and Error Analysis for selected response questions:

Question Number	TEKS	Correct Answer	Conceptual Error	Conceptual Error	Procedural Error	Procedural Error	Guess
1	7.1B	D	A	C	B		
2	7.3A	B	A	C			D
3	7.1B	B	A	C			D
4	7.3A	A	B	C			D

Pieces of Candy Bars (Answer Key)

Your generous teacher is sharing pieces of chocolate candy bars with you. The original candy bar is the same size as a flat from the set of base ten blocks. Cut out each of the pieces that your group has been given to find out what part of a candy bar each piece represents. Write the size of each piece as a fraction, a decimal and a percent in the table below.

Candy Bar Piece	Portion of Whole as a Fraction	Portion of Whole as a Decimal	Portion of Whole as a Percent
A	$\frac{4}{100}=\frac{1}{25}$	*0.04*	*4%*
B	$\frac{35}{100}=\frac{7}{20}$	*0.35*	*35%*
C	$\frac{28}{100}=\frac{7}{25}$	*0.28*	*28%*
D	$\frac{60}{100}=\frac{3}{5}$	*0.6*	*60%*

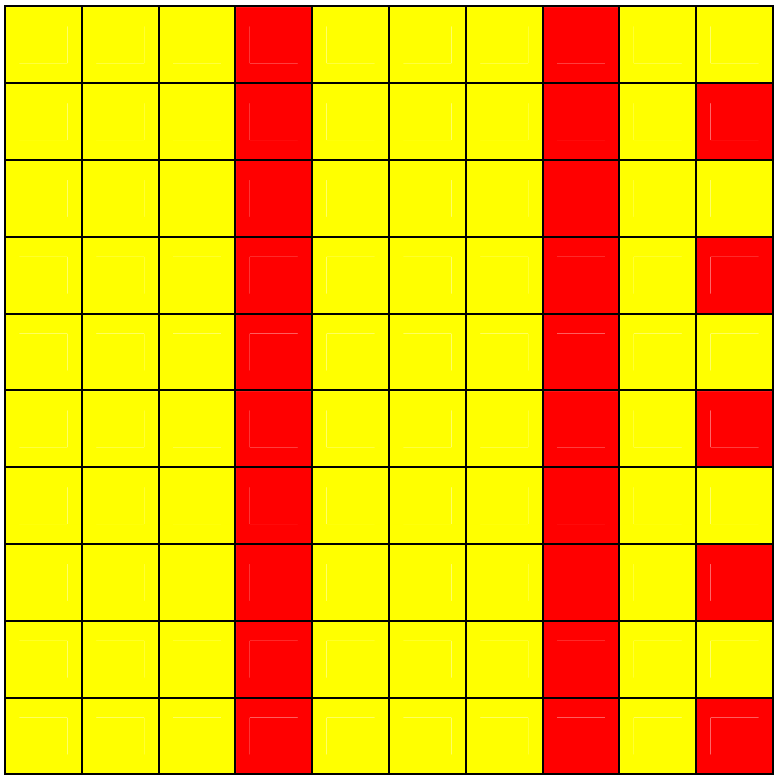


Making Models (Answer Key)

1. A box of 4 lollipops contains 1 red and 3 yellow lollipops.

   a) Write a fraction representing the number of yellow lollipops in a box: $\frac{3}{4}$

   b) If the ratio of red to yellow lollipops stays the same, color the grid to show the number of yellow and red lollipops in a box of 100 lollipops.



   a) Complete the table below using your colored hundredths-grid as a reference.

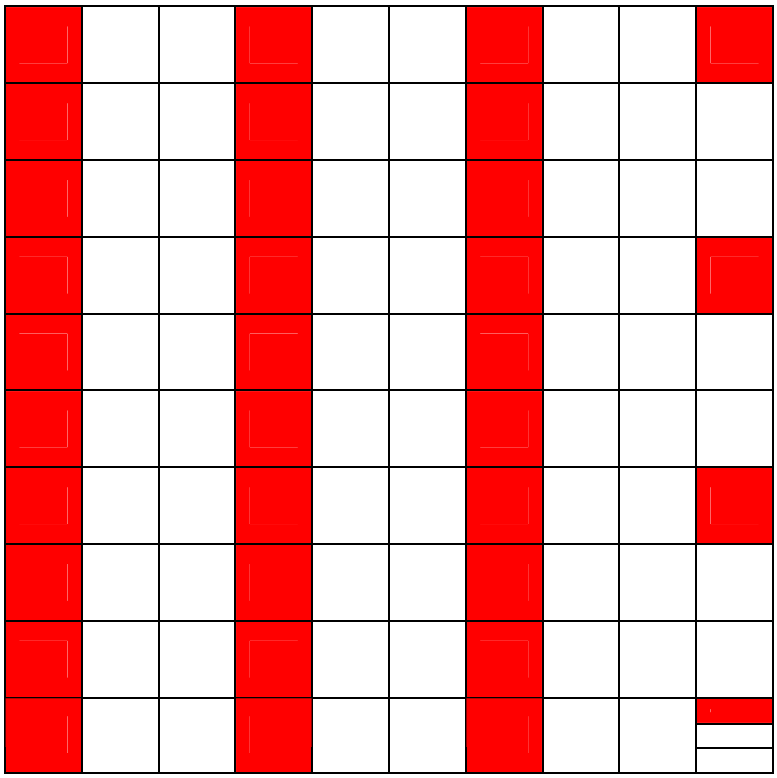
Color of Lollipops	As a Fraction (out of 100)	As a Fraction (simplest form)	As a Decimal	As a Percent
Red	$\frac{25}{100}$	$\frac{1}{4}$	*0.25*	*25%*
Yellow	$\frac{75}{100}$	$\frac{3}{4}$	*0.75*	*75%*
Red or Yellow	$\frac{100}{100}$	$\frac{4}{4} = 1$	*1.0*	*100%*

Making Models (Answer Key)

2. One out of every 3 rabbits in the pet store has floppy ears.

   a) Write a fraction representing the number of floppy-eared rabbits at the pet store: $\frac{1}{3}$

   b) Color the grid to show the percent of floppy-eared rabbits at the pet store.



   a) Complete the table below using your colored hundredths-grid as a reference.

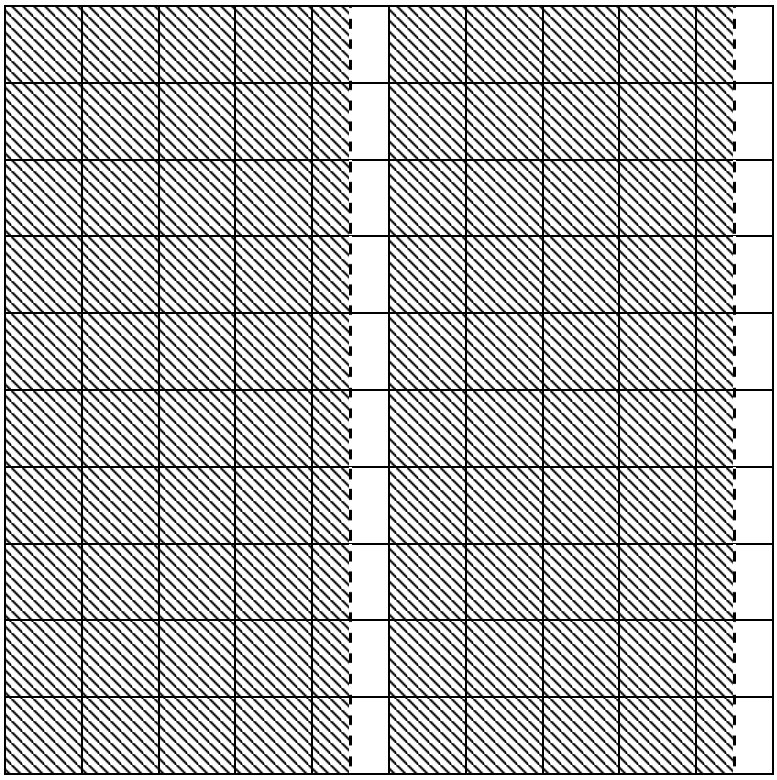
Type of Rabbit Ears	As a Fraction (out of 100)	As a Fraction (simplest form)	As a Decimal	As a Percent
Floppy	$\frac{33\frac{1}{3}}{100}$	$\frac{1}{3}$	$0.\overline{33}$	$33\frac{1}{3}\%$
Non-Floppy	$\frac{66\frac{2}{3}}{100}$	$\frac{2}{3}$	$0.\overline{66}$	$66\frac{2}{3}\%$

Making Models (Answer Key)

3. Ameena had 5 cupcakes left after her birthday party. While she was cleaning up, her dog, Marty, ate $4\frac{1}{2}$ of them.

   a) Write a fraction representing the number of cupcakes that Marty ate: $\frac{4\frac{1}{2}}{5}$

   b) Color the grid to show the percent of cupcakes Marty ate.



   a) Complete the table below using your colored hundredths-grid as a reference.

	As a Fraction (out of 100)	As a Fraction (simplest form)	As a Decimal	As a Percent
Number of cupcakes eaten by Marty	$\frac{90}{100}$	$\frac{9}{10}$	*0.9*	*90%*
Number of cupcakes left	$\frac{10}{100}$	$\frac{1}{10}$	*0.1*	*10%*

Traveling Around (Answer Key)

1. Take your worksheet to any other student and choose a problem to work. You should agree to work the same problem on each other's paper.
2. When each of you has finished, check your answer, sign your name in the shaded area under the problem, take your worksheet to another student, and repeat the process.
3. Continue this procedure until all of your problems are worked. Each student may work only one problem on your worksheet.

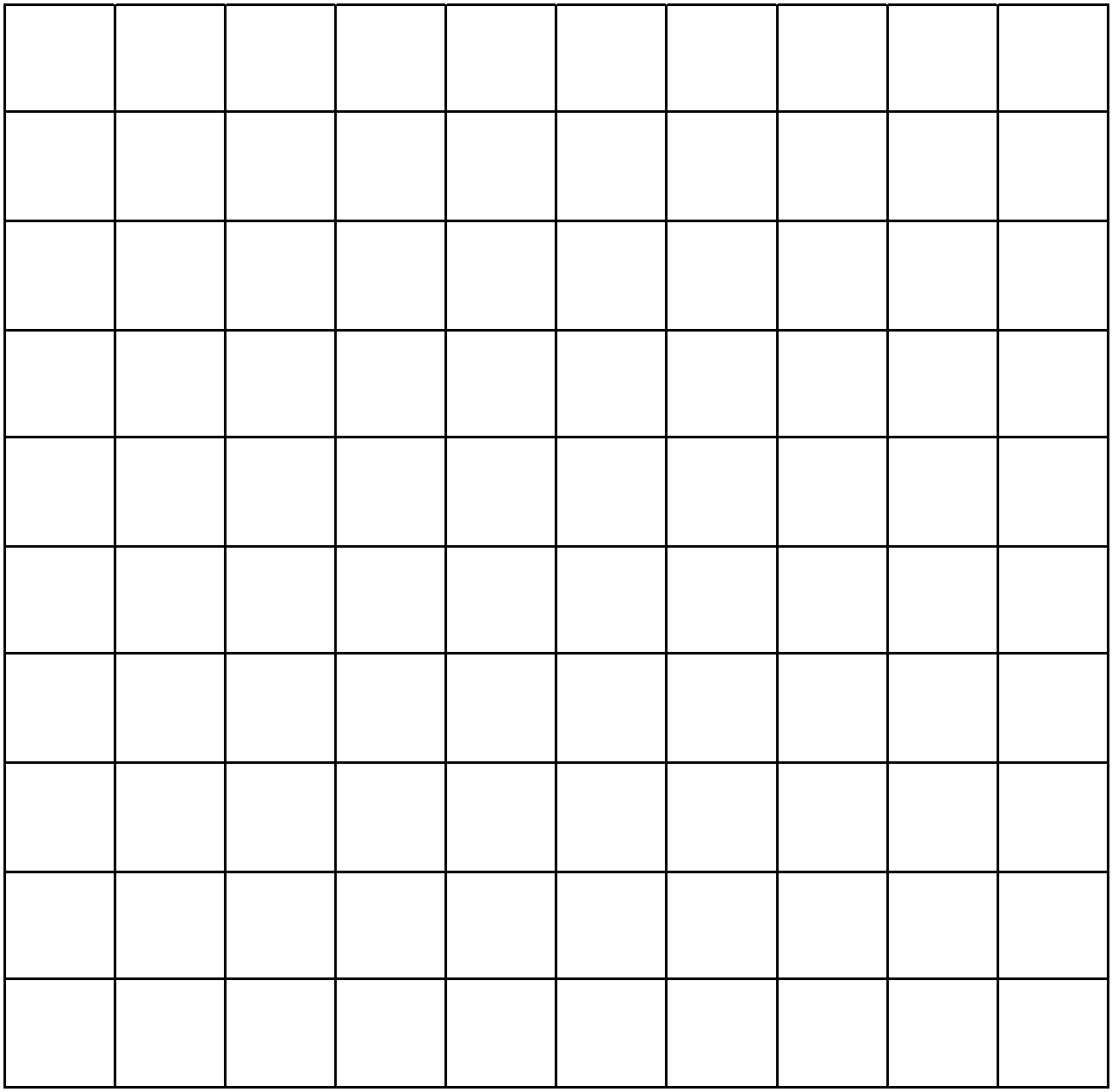
1. Five out of 8 people surveyed said that they prefer to vacation at the beach rather than at an amusement park. What percent of the people surveyed preferred a beach vacation? $\frac{5}{8} = \frac{\quad}{100}$ $62\frac{1}{2}\%$	2. Four out of twelve markers in a pack are a shade of green. What percent of the pack is green? $\frac{4}{12} = \frac{\quad}{100}$ $33\frac{1}{3}\%$	3. There are 5 birds in the tree. If 60% of them have orange tails, how many birds have orange tails? $\frac{60}{100} = \frac{\quad}{5}$ *3 birds*
Signature	Signature	Signature
4. Thirty percent of the people in a movie theater purchase candy to eat while watching the movie. If there are 250 people in the theater, how many of them would you expect to purchase candy? $\frac{30}{100} = \frac{\quad}{250}$ *75 people*	5. Forty-five percent of seventh-grade students wear sneakers. If there are 500 seventh-grade students, how many wear sneakers? $\frac{45}{100} = \frac{\quad}{500}$ *225 students*	6. Seven out of every 20 customers at the grocery store win a free soda. What percent of the customers will win a free soda? $\frac{7}{20} = \frac{\quad}{100}$ *35%*
Signature	Signature	Signature

Devon's Doughnut Dilemma (Answer Key)

Devon bought two dozen doughnuts from Donald's Doughnut Shack. Of the doughnuts he purchased, $\frac{1}{8}$ of them had sprinkles, 25% of them had chocolate icing, $\frac{1}{3}$ were cream filled, and the rest were glazed. How many glazed doughnuts did Devon buy?

Devon bought 7 glazed doughnuts.

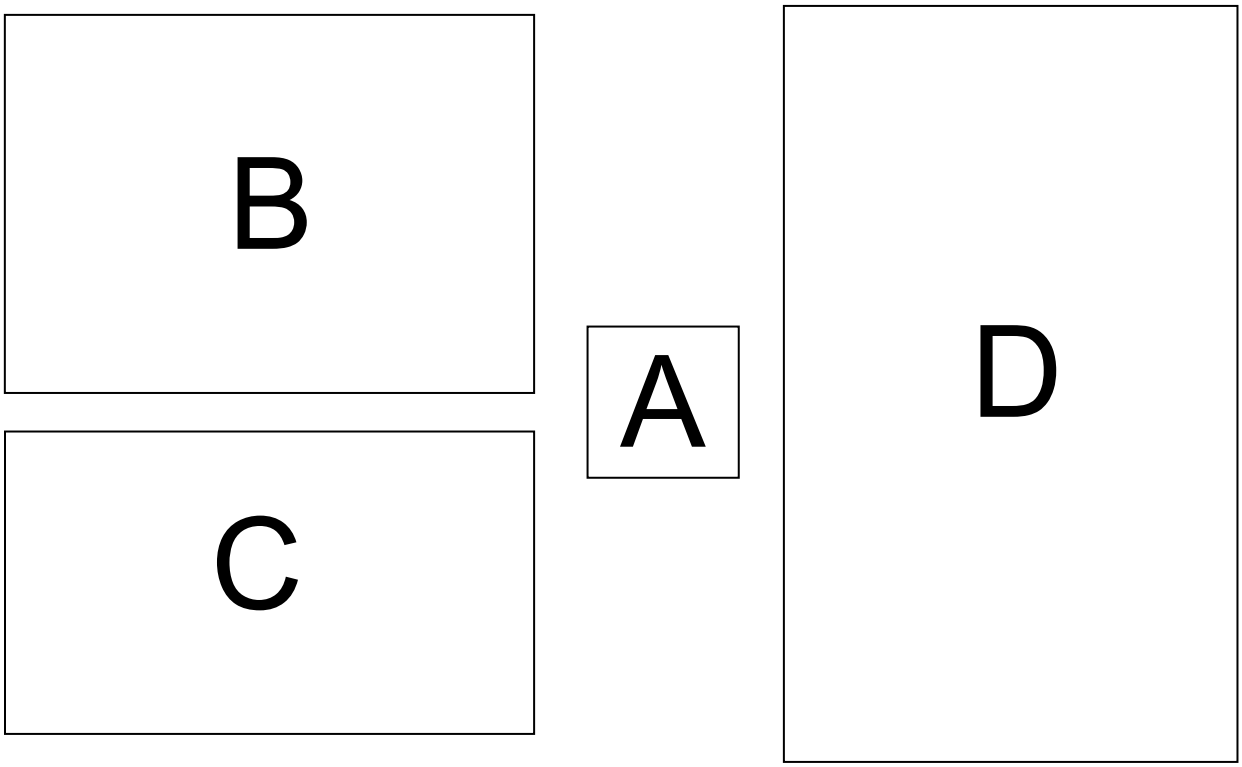
Transparency: 100-Grid



Pieces of Candy Bars

Your generous teacher is sharing pieces of chocolate candy bars with you. The original candy bar is the same size as a flat from the set of base ten blocks. Cut out each of the pieces that your group has been given to find out what part of a candy bar each piece represents. Write the size of each piece as a fraction, a decimal and a percent in the table below.

Candy Bar Piece	Portion of Whole as a Fraction	Portion of Whole as a Decimal	Portion of Whole as a Percent
A			
B			
C			
D			

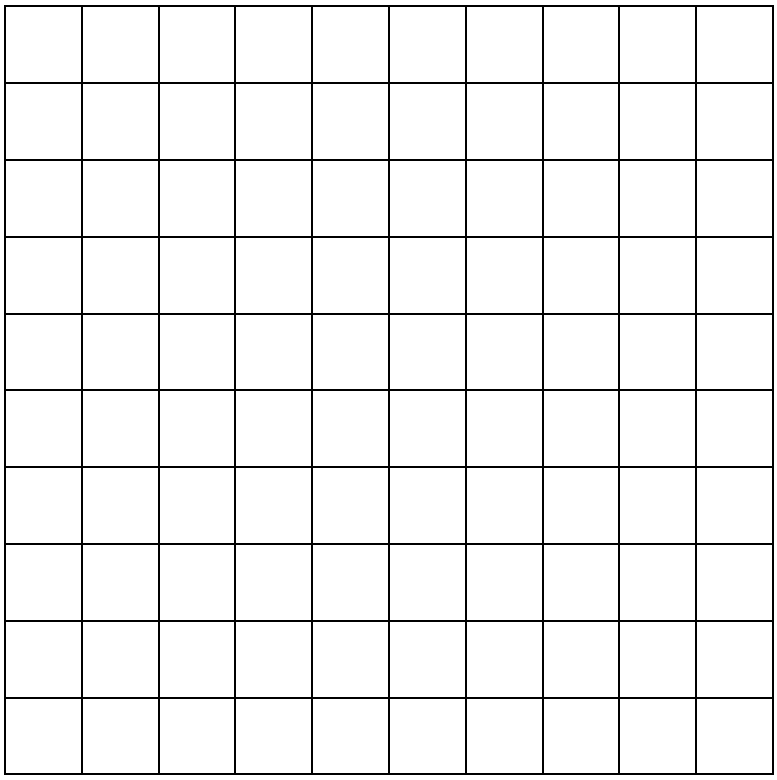


Making Models

1. A box of 4 lollipops contains 1 red and 3 yellow lollipops.

   a) Write a fraction representing the number of yellow lollipops in a box: _____

   b) If the ratio of red to yellow lollipops stays the same, color the grid to show the number of yellow and red lollipops in a box of 100 lollipops.



   c) Complete the table below using your colored hundredths-grid as a reference.

Color of Lollipops	As a Fraction (out of 100)	As a Fraction (simplest form)	As a Decimal	As a Percent
Red				
Yellow				
Red or Yellow				

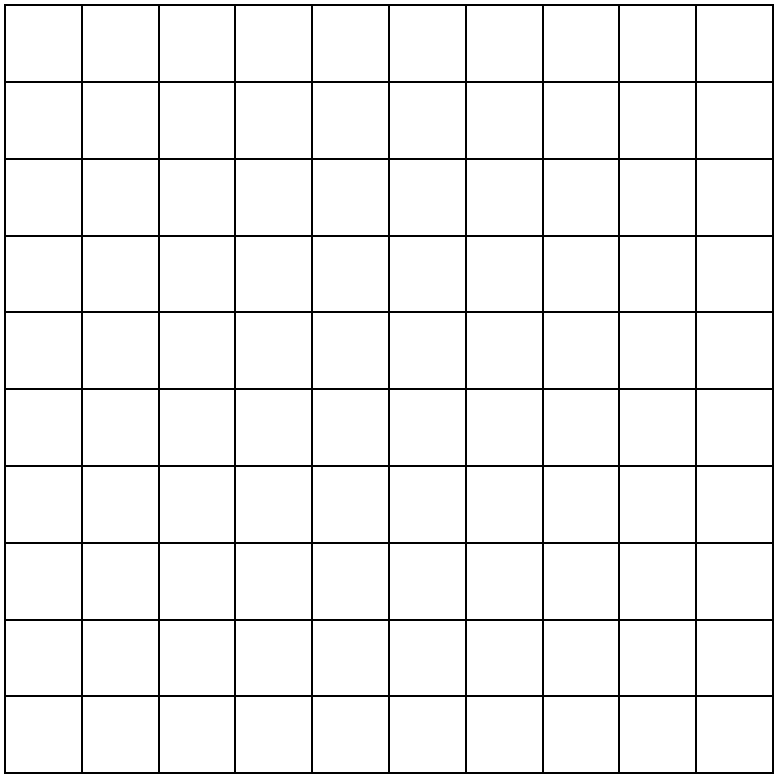
Making Models

2. One out of every 3 rabbits in the pet store has floppy ears.

   a) Write a fraction representing the number of floppy-eared rabbits at the pet store:

   _____

   b) Color the grid to show the percent of floppy-eared rabbits at the pet store.



   c) Complete the table below using your colored hundredths-grid as a reference.

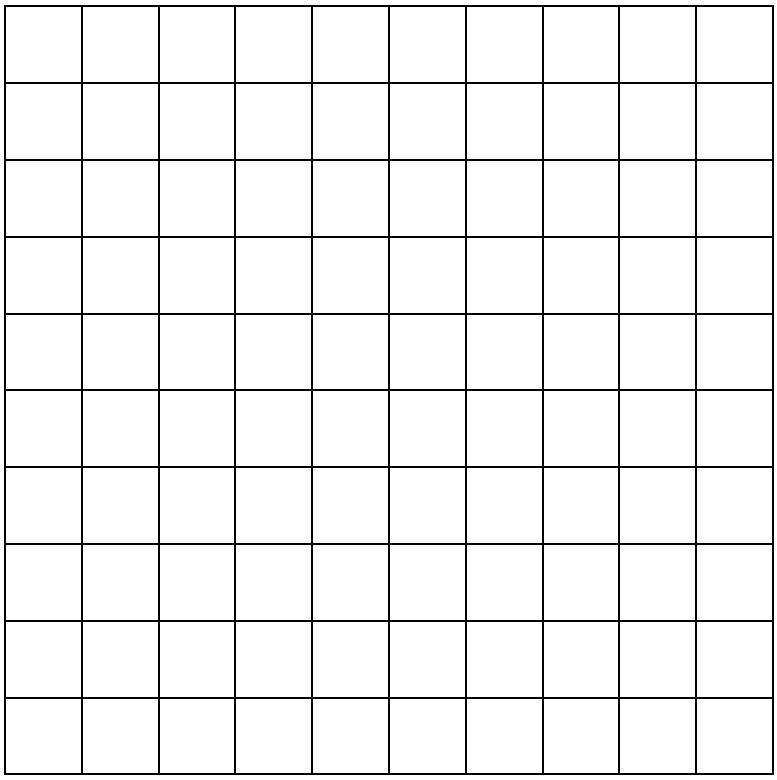
Type of Rabbit Ears	As a Fraction (out of 100)	As a Fraction (simplest form)	As a Decimal	As a Percent
Floppy				
Non-Floppy				

Making Models

3. Ameena had 5 cupcakes left after her birthday party. While she was cleaning up, her dog, Marty, ate $4\frac{1}{2}$ of them.

   a) Write a fraction representing the number of cupcakes that Marty ate: _____

   b) Color the grid to show the percent of cupcakes Marty ate.



   c) Complete the table below using your colored hundredths-grid as a reference.

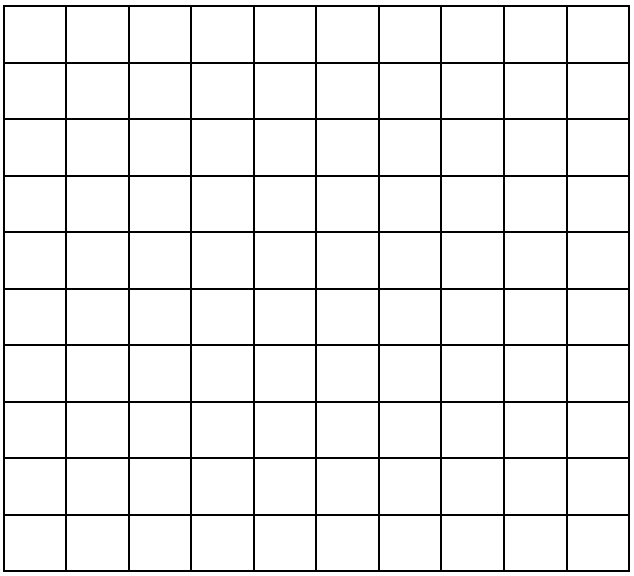
	As a Fraction (out of 100)	As a Fraction (simplest form)	As a Decimal	As a Percent
Number of cupcakes eaten by Marty				
Number of cupcakes left				

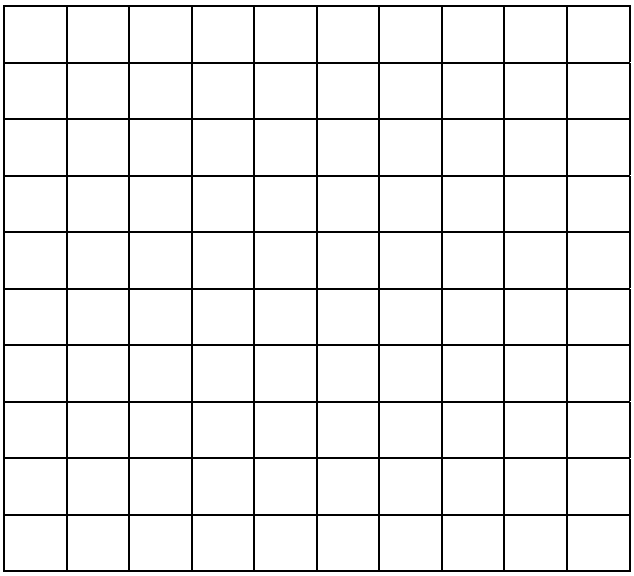
Traveling Around

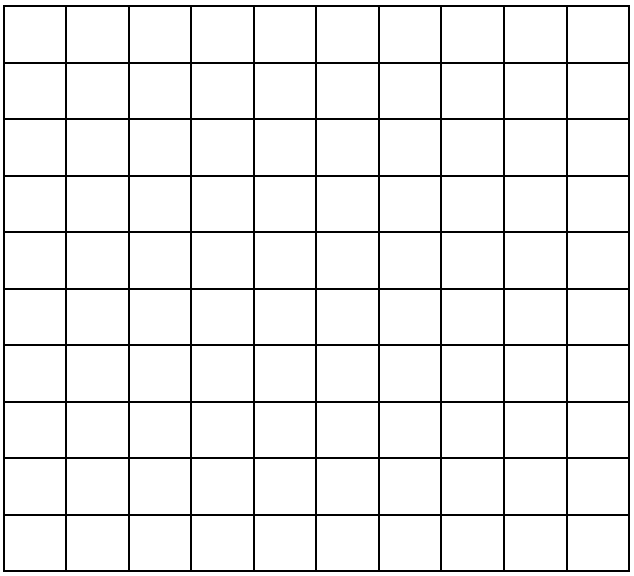
1. Take your worksheet to any other student and choose a problem to work. You should agree to work the same problem on each other's paper.
2. When each of you has finished, check your answer, sign your name in the shaded area under the problem, take your worksheet to another student, and repeat the process.
3. Continue this procedure until all of your problems are worked. Each student may work only one problem on your worksheet.

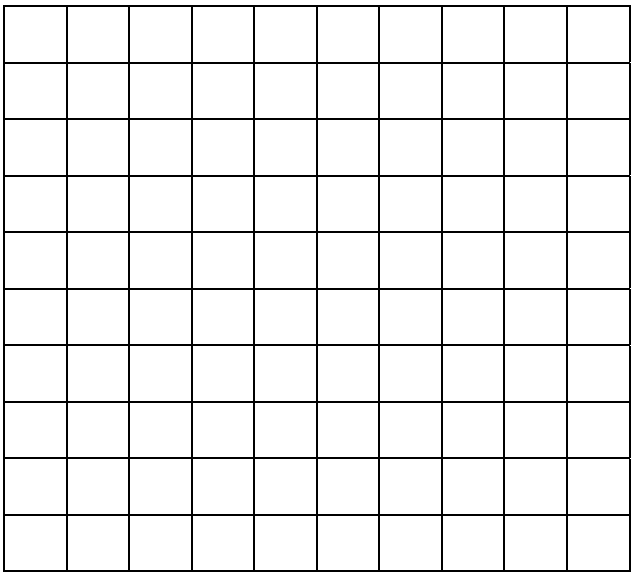
1. Five out of 8 people surveyed said that they prefer to vacation at the beach rather than at an amusement park. What percent of the people surveyed preferred a beach vacation?	2. Four out of twelve markers in a pack are a shade of green. What percent of the pack is green?	3. There are 5 birds in the tree. If 60% of them have orange tails, how many birds have orange tails?
Signature	Signature	Signature
4. Thirty percent of the people in a movie theater purchase candy to eat while watching the movie. If there are 250 people in the theater, how many of them would you expect to purchase candy?	5. Forty-five percent of seventh-grade students wear sneakers. If there are 500 seventh-grade students, how many wear sneakers?	6. Seven out of every 20 customers at the grocery store win a free soda. What percent of the customers will win a free soda?
Signature	Signature	Signature

100-Grids









Devon's Doughnut Dilemma

Devon bought two dozen doughnuts from Donald's Doughnut Shack. Of the doughnuts he purchased, $\frac{1}{8}$ of them had sprinkles, 25% of them had chocolate icing, $\frac{1}{3}$ were cream filled, and the rest were glazed. How many glazed doughnuts did Devon buy?

1 Mr. Marlin is supervising the work at 4 different jobs sites. The amount of work completed at each site is shown in the table below.

Work Completed

Site	Percent Completed
A	$62\frac{1}{2}\%$
B	60%
C	70%
D	75%

Which list shows the percent of work completed at each site in order from least to greatest?

A $\frac{3}{5}, \frac{3}{4}, \frac{5}{8}, \frac{7}{10}$

B $\frac{3}{4}, \frac{7}{10}, \frac{5}{8}, \frac{3}{5}$

C $\frac{3}{4}, \frac{3}{5}, \frac{5}{8}, \frac{7}{10}$

D $\frac{3}{5}, \frac{5}{8}, \frac{7}{10}, \frac{3}{4}$

2 In a bag of assorted fruit flavored candies, 2.5 out of every 50 candies are watermelon flavored. What percent of the candies are watermelon flavored?

A 2.5%

B 5%

C 7.5%

D 50%

3 Which of the following is NOT equivalent to 0.4?

A $\frac{2}{5}$

B 4%

C $\frac{16}{40}$

D 40%

4 Of the 70 stores at the William's Mall, 30% sell food items. How many stores sell food items?

A 21

B 30

C 40

D 210

Birthday Party Plans

TEKS

7.2A Number, operation, and quantitative reasoning. The student adds, subtracts, multiplies, and divides to solve problems and justify solutions. The student is expected to represent multiplication and division situations involving fractions and decimals with models, including concrete objects, pictures, words, and numbers.

7.2B Number, operation, and quantitative reasoning. The student adds, subtracts, multiplies, and divides to solve problems and justify solutions. The student is expected to use addition, subtraction, multiplication, and division to solve problems involving fractions and decimals.

7.2G Number, operation, and quantitative reasoning. The student adds, subtracts, multiplies, and divides to solve problems and justify solutions. The student is expected to determine the reasonableness of a solution to a problem.

7.14A Underlying processes and mathematical tools. The student communicates about Grade 7 mathematics through informal and mathematical language, representations, and models. The student is expected to communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

7.15A Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to make conjectures from patterns or sets of examples and nonexamples.

7.15B Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to validate his/her conclusions using mathematical properties and relationships.

Materials

Advance preparation:

- **Transparency: Birthday Party**
- Overhead proportional rods

For each student:

- Proportional rods
- **Party Time**
- **Party Punch**
- **Punch Bowl** and selected response items

Engage

The Engage portion of the lesson is designed to generate student interest in the concepts addressed and make connections to past and present learning. This part of the lesson is designed for groups of three to four students.

1. Display **Transparency: Birthday Party** and distribute a set of proportional rods to each student.
2. Prompt students to work together to solve the problem.
3. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Engage Phase

- How can you represent $\frac{1}{3}$ cup with the rods? Why?

  Responses may vary. Possible response: I could use a white rod to represent $\frac{1}{3}$ cup because it takes 3 white rods to equal the length of 1 light green rod.
- How can you rearrange the rods to find a solution?
  Responses may vary. Possible response: Every 3 white rods equal the length of a light green rod, so I could replace 3 white rods with a light green rod. When I do that, I have 5 light green rods and 1 white rod which represents $5\frac{1}{3}$ cups.

Explore

The Explore portion of the lesson provides the student with an opportunity to be actively involved in the exploration of the mathematical concepts addressed. This part of the lesson is designed for groups of three to four students.

1. Distribute **Party Time** to each student.
2. Prompt students to use the proportional rods and work together to complete **Party Time**.
3. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Explore Phase

- If 1 cup is represented by a yellow rod, what could you use to represent $\frac{1}{5}$ cup? Why?
  Responses may vary. Possible response: 1 white rod
- If 1 minute is represented by an orange rod, what could you use to represent $\frac{1}{2}$ minute? Why?
  Responses may vary. Possible response: 5 white rods or 1 yellow rod
- What color could you use to represent 1 meter of streamer? Why?
  Responses may vary. Possible response: 1 yellow rod because I need to be able to divide it into fifths and 5 white rods equals the length of 1 yellow rod

Explain

The Explain portion of the lesson is directed by the teacher to allow the students to formalize their understanding of the TEKS addressed in the lesson.

1. Debrief **Party Time**.
2. Use the Facilitation Questions to lead the discussion.

Facilitation Questions – Explain Phase
(Use the overhead proportional rods to model each problem as it is discussed.)
Pizza Problem

- How did you represent $1\frac{4}{5}$ cup of cheese?
  Responses may vary. One yellow rod and 4 white rods.
- Since the problem asked for the amount of cheese for 3 pizzas, what was your next step?
  Responses may vary. Possible response: Repeat the yellow rod and 4 white rods a total of 3 times for the 3 pizzas. So you would need a total of 3 yellow rods and 12 white rods.
- What did each yellow rod represent? How many total cups are represented by all of the yellow rods?
  Each yellow rod represents 1 cup so all of the yellow rods represent 3 cups.
- What did each white rod represent? Twelve white rods would represent how many cups?
  $\frac{1}{5}$ *cup;* $\frac{12}{5}$ *cups*

Facilitation Questions – Explain Phase (continued)

Pizza Problem (continued)

- What is $\frac{12}{5}$ as a mixed number?

  $2\frac{2}{5}$

- So if you combine the cups represented by the yellow rods and white rods, how many cups would you have in all?

  $5\frac{2}{5}$ *cups*

CD Problem

- How did you represent $2\frac{1}{2}$ minutes?

  Responses may vary. Possible response: Use 2 orange rods and 1 yellow rod.

- Since the problem asked for the number of minutes for 4 songs, what was your next step?
  Responses may vary. Possible response: Repeat the 2 orange rods and 1 yellow rod a total of 4 times for the 4 songs. So you would need a total of 8 orange rods and 4 yellow rods.
- What do the 8 orange rods represent?
  8 minutes
- What do the 4 yellow rods represent?
  Four half-minutes or 2 minutes
- So if you combine the orange rods and yellow rods, how many minutes in all will the CD last?
  10 minutes

Streamers

- What did you use to represent 1 meter of streamer?
  Responses may vary. Possible response: 1 yellow rod
- What did you use to represent $2\frac{2}{5}$ meters of streamers?

  Responses may vary. Possible response: 2 yellow rods and 2 white rods

- Since the problem asked for the length of 3 streamers, what was your next step?
  Responses may vary. Possible response: Repeat the 2 yellow rods and 2 white rods a total of 3 times. So you would need a total of 6 yellow rods and 6 white rods.
- What do the 6 yellow rods represent?
  6 meters
- What do the 6 white rods represent?
  $\frac{6}{5}$ *meters*

Facilitation Questions – Explain Phase (continued)

Streamers (continued)

- So if you combine the yellow rods and white rods, how many meters in all are there?

  $7\frac{1}{5}$ *meters*

Making Connections

- What could we do if we wanted to solve $3 \times 4\frac{1}{5}$ without the use of models?

  Responses may vary. Possible response: You would need three 4s and three $\frac{1}{5}$*s so you would have* $12\frac{3}{5}$.

- How could you solve $2 \times 4\frac{3}{5}$ without models?

  Responses may vary. Possible response: You need two 4s and two $\frac{3}{5}$*s for a total of* $8\frac{6}{5}$ *or* $9\frac{1}{5}$.

- What is the benefit of using models to help you solve problems such as these?
  Responses may vary. Possible response: It lets me "picture" the model and helps me understand what is happening. I can do problems like these mentally now that I see what happened with the models.

Elaborate

The Elaborate portion of the lesson provides an opportunity for the student to apply the concepts of the TEKS within a new situation. This part of the lesson is designed for groups of three to four students.

1. Distribute **Party Punch** to each student.
2. Prompt students to work together to solve this problem using their proportional rods.
3. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Elaborate Phase

- What is the relationship between the red rod and purple rod?
  Responses may vary. Possible response: The red rod is half the length of the purple rod. Since the purple rod represents 1 quart, the red rod represents $\frac{1}{2}$ *quart.*
- What is the relationship between the white rod and purple rod?
  Responses may vary. Possible response: The white rod is one-fourth the length of the purple rod. Since the purple rod represents 1 quart, the white rod represents $\frac{1}{4}$ *quart.*
- How can you take half of a group of rods?
  Responses may vary. Possible response: Divide the rods into 2 equal groups. I may need to break a rod down into smaller pieces so that I can divide it evenly.

Evaluate

The Evaluate portion of the lesson provides the student with an opportunity to demonstrate his or her understanding of the TEKS addressed in the lesson.

1. Provide each student with proportional rods and **Punch Bowl**.
2. Upon completion of the activity sheet, a rubric should be used to assess student understanding of the concepts addressed in the lesson.

Responses and Error Analysis for selected response questions:

Question Number	TEKS	Correct Answer	Conceptual Error	Conceptual Error	Procedural Error	Procedural Error	Guess
1	7.2B	C	A	B			D
2	7.2A	A	B	C			D
3	7.2B	B	A	C	D		
4	7.2B	C	A	B	D		

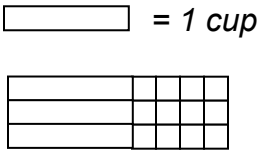
Party Time (Answer Key)

Pictorial representations are possible answers.

John's mother is making pizzas for the birthday party. She uses $1\frac{4}{5}$ cup of cheese for each pizza. If she makes 3 pizzas, how many cups of cheese will she need in all?

Use the **yellow rod** to represent 1 cup of cheese.

Pictorial Representation

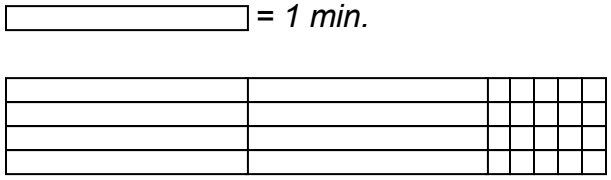


Numerical Representation	Solution
$3 \times 1\frac{4}{5}$	$5\frac{2}{5}$ cups

John is making a CD of his favorite songs to play at his party. If each song is approximately $2\frac{1}{2}$ minutes long and he puts 4 songs on the CD, how many minutes of music will he have in all?

Use the **orange rod** to represent 1 minute.

Pictorial Representation

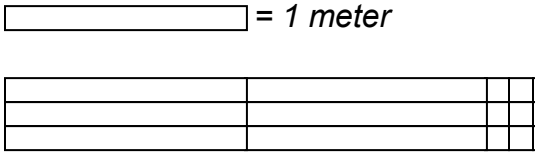


Numerical Representation	Solution
$4 \times 2\frac{1}{2}$	10 min.

John's mother is hanging streamers for the party. Each streamer is $2\frac{2}{5}$ meters long. If she hangs 3 streamers end to end, what is the total length of the streamers?

Use the _____ rod to represent 1 meter.

Pictorial Representation



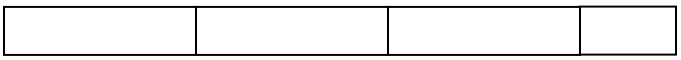
Numerical Representation	Solution
$3 \times 2\frac{2}{5}$	$7\frac{1}{5}$ meters

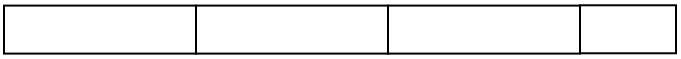
Party Punch (Answer Key)

A punch recipe makes $3\frac{1}{2}$ quarts of punch. If John's mother makes $2\frac{1}{2}$ recipes of punch, how many quarts of punch will there be in all?

Let the purple rod represent 1 quart.

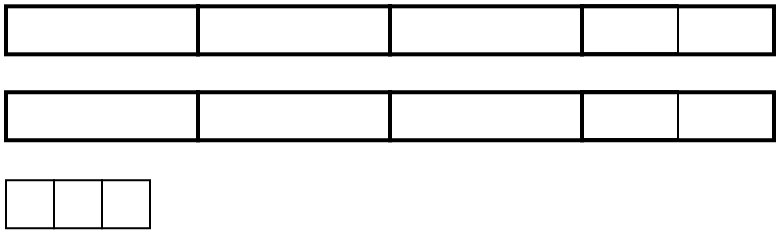
Answers may vary. Possible answer:
Let 1 purple rod equal 1 quart. Then a red rod equals $\frac{1}{2}$ quart.


= 1 recipe


= 1 recipe


= $\frac{1}{2}$ recipe

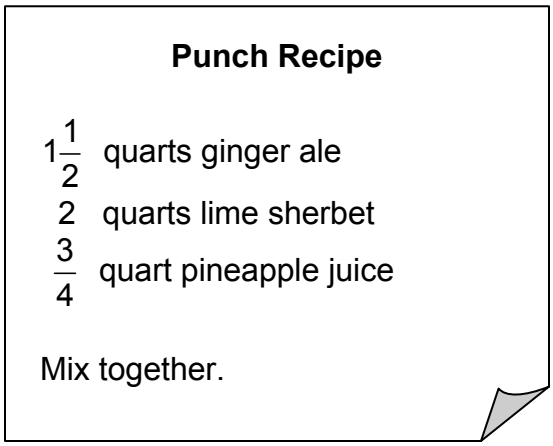
The rods can be rearranged to see the solution.



The solution is $8\frac{3}{4}$ quarts.

Punch Bowl (Answer Key)

The punch recipe John's mother uses is shown below.



If she triples the recipe, will the punch fit into her 12 quart punch bowl? Justify your answer.

No, it will not fit.

Transparency: Birthday Party

At the party, each of the 8 children in attendance was served $\frac{2}{3}$ cup of punch.

How much punch was served in all?

Use the light green proportional rod to represent 1 cup.

Party Time

<table>
<tr><td rowspan="3">John's mother is making pizzas for the birthday party. She uses $1\frac{4}{5}$ cup of cheese for each pizza. If she makes 3 pizzas, how many cups of cheese will she need in all?

Use the yellow rod to represent 1 cup of cheese.</td><td colspan="2">Pictorial Representation</td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="3">John is making a CD of his favorite songs to play at his party. If each song is approximately $2\frac{1}{2}$ minutes long and he puts 4 songs on the CD, how many minutes of music will he have in all?

Use the orange rod to represent 1 minute.</td><td colspan="2">Pictorial Representation</td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="3">John's mother is hanging streamers for the party. Each streamer is $2\frac{2}{5}$ meters long. If she hangs 3 streamers end to end, what is the total length of the streamers?

Use the _____ rod to represent 1 meter.</td><td colspan="2">Pictorial Representation</td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td></td><td></td></tr>
</table>

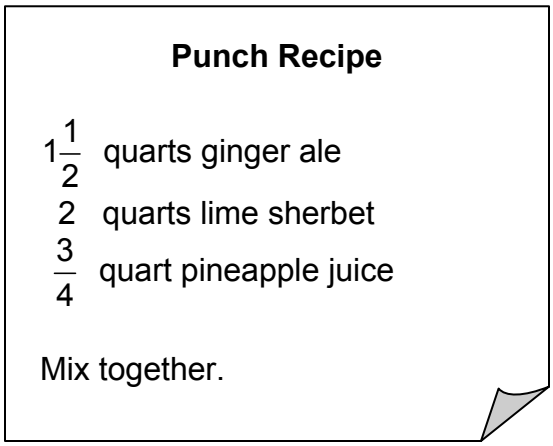
Party Punch

A punch recipe makes $3\frac{1}{2}$ quarts of punch. If John's mother makes $2\frac{1}{2}$ recipes of punch, how many quarts of punch will there be in all?

Let the purple rod represent 1 quart.

Punch Bowl

The punch recipe John's mother uses is shown below.



If she triples the recipe, will the punch fit into her 12 quart punch bowl? Justify your answer.

1 Brandon bought 3 bags of apples. Each bag contained $2\frac{1}{2}$ pounds. How many pounds of apples did he buy in all?

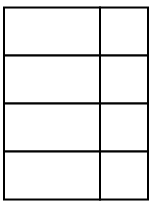
A $5\frac{1}{2}$ pounds

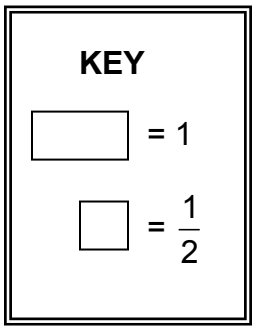
B $6\frac{1}{2}$ pounds

C $7\frac{1}{2}$ pounds

D $8\frac{1}{2}$ pounds

2 What problem is modeled below?





A $4 \times 1\frac{1}{2}$

B $4 \times 1\frac{1}{4}$

C $4 \times \frac{1}{2}$

D $1 \times 4\frac{1}{2}$

3 Carrie spent $1\frac{3}{4}$ hours at the gym last week. If she spends twice that amount of time at the gym this week, how many hours will she spend at the gym this week?

A $3\frac{3}{4}$ hours

B $3\frac{1}{2}$ hours

C $2\frac{3}{4}$ hours

D $2\frac{1}{2}$ hours

4 For a certain recipe, each cupcake requires $\frac{1}{4}$ cup of icing. If 2 dozen cupcakes are made, how much icing is needed in all?

A $\frac{1}{2}$ cup

B 3 cups

C 6 cups

D 8 cups

Sweet Tooth

TEKS

8.1A Number, operation, and quantitative reasoning. The student understands that different forms of numbers are appropriate for different situations. The student is expected to compare and order rational numbers in various forms including integers, percents, and positive and negative fractions and decimals.

8.1B Number, operation, and quantitative reasoning. The student understands that different forms of numbers are appropriate for different situations. The student is expected to select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships.

8.2B Number, operation, and quantitative reasoning. The student selects and uses appropriate operations to solve problems and justify solutions. The student is expected to use appropriate operations to solve problems involving rational numbers in problem situations.

8.3B Patterns, relationships, and algebraic thinking. The student identifies proportional or nonproportional linear relationships in problem situations and solves problems. The student is expected to estimate and find solutions to application problems involving percents and other proportional relationships such as similarity and rates.

8.14D Underlying processes and mathematical tools. The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to select tools such as real objects, manipulatives, paper/pencil, and technology such as mental math, estimation, and number sense to solve problems.

8.15A Underlying processes and mathematical tools. The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. The student is expected to communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

8.16A Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to make conjectures from patterns or sets of examples and nonexamples.

Materials

Advance preparation:

- **Candy Cards** – 1 set cut apart for each group of 3 – 4 students
- **Transparency: 100-Grid**
- Paper color tiles or 1 inch squares – about 50 tiles for each group of 3 – 4 students

For each group of 3 – 4 students:
- Tape or glue stick
- **100-Grids** – 1 per group
- Scissors

For each student:
- **Candy Capers Part 1**
- **Candy Capers Part 2**
- **What a Mess!**
- **Chocolate Milk** and selected response items

Engage

The Engage portion of the lesson is designed to generate student interest in the concepts addressed and make connections to past and present learning. This part of the lesson is designed for groups of three to four students.

1. Distribute **Candy Capers Part 1** to each student. Provide each group with paper color tiles, tape or glue sticks, scissors, and **Candy Cards**.
2. Prompt groups to use the color tiles to model each situation, then tape them to **Candy Capers Part 1** and record the results. *(Or the students may sketch the model onto **Candy Capers**.)*
3. The teacher should actively monitor student work and ask Facilitation Questions when appropriate.

Facilitation Questions – Engage Phase
- If 100% is represented by 1 tile, how many tiles would you use to represent 200%? Why?
  Two tiles because it is twice the size
- 150% is how many times bigger than 50%? How does this relate to the number of candies in each bag?
  150% is 3 times the size of 50%. The bag that is 150% the size of the original bag has 3 times the number of candies as the bag that is 50% the size of the original bag.
- What patterns do you see in the table?
  Responses may vary. Possible response: Every time the percent increases by 50%, there are an additional 4 candies in the bag.

Explore

The Explore portion of the lesson provides the student with an opportunity to be actively involved in the exploration of the mathematical concepts addressed. This part of the lesson is designed for groups of three to four students.

1. Distribute **Candy Capers Part 2**.
2. Prompt students to work in groups to complete the table.

3. The teacher should actively monitor student work and ask Facilitation Questions when appropriate.

Facilitation Questions – Explore Phase

- What could you use to represent the original bag of candy?
  Responses may vary. Possible response: I could use one tile to represent the original bag.
- How does the new percent compare to the original percent?
  Responses may vary.
- Is the data proportional? How do you know?
  Responses may vary. Possible response: Yes, the data is proportional. When I look at the table, I can generate new values by finding multiples of previous values. For example, since 50% of the original bag is 400 candies, I can multiply 50% and 400 by 3 to find that 150% of the original bag is 1,200 candies.

Explain

The Explain portion of the lesson is directed by the teacher to allow the students to formalize their understanding of the TEKS addressed in the lesson.

1. Debrief **Candy Capers**.
2. Use the Facilitation Questions to lead the discussion.

Facilitation Questions – Explain Phase

- What patterns do you see in the table?
  Responses may vary.
- What does "percent" mean?
  Out of 100
- How can you change a percent to a fraction?
  Responses may vary. Possible response: Since a percent compares a number to 100, I can write the percent over 100.
- What is 17% as a fraction?
  $\frac{17}{100}$
- What is 250% as a fraction?
  $\frac{250}{100} = \frac{5}{2} = 2\frac{1}{2}$
- If you follow the previous two examples, what is $\frac{1}{4}$% as a fraction?
  $\frac{\frac{1}{4}}{100}$

Facilitation Questions – Explain Phase (continued)

- What operation does a fraction bar imply?
  Division.
- What can we do to simplify $\frac{\frac{1}{4}}{100}$? What is the answer?
  Divide $\frac{1}{4}$ by 100 to get $\frac{1}{400}$.
- How does this compare to your ratio for $\frac{1}{4}\%$ on your table on Candy Capers?
  It is the same.
- Display **Transparency: 100-Grid**. How would you show 10% on this grid?
  Responses may vary. Possible response: Shade a column of 10 squares. (Provide a transparency marker to a student and allow the student to demonstrate.)
- How would you show 1%?
  Responses may vary. Possible response: Shade 1 square. (Allow a student to demonstrate.)
- If 1% is 1 square, how could you shade $\frac{1}{2}\%$?
  Responses may vary. Possible response: Shade $\frac{1}{2}$ of 1 square. (Allow a student to demonstrate.)
- How can you use the 100-grid to find the value of $\frac{1}{2}\%$ as a fraction?
  Responses may vary. Possible response: There are 200 pieces the size of $\frac{1}{2}\%$ on the 100-grid. I have shaded only 1 of them, so $\frac{1}{2}\%$ is equivalent to $\frac{1}{200}$.

Elaborate

The Elaborate portion of the lesson provides an opportunity for the student to apply the concepts of the TEKS within a new situation. This part of the lesson is designed for groups of three to four students.

1. Distribute **What a Mess!** to each student and provide **100-Grids** to groups of students.
2. Prompt students to work together to solve the problem and use the **100-Grids** if they find them helpful.
3. The teacher should actively monitor student work and ask Facilitation Questions when appropriate.

Facilitation Questions – Elaborate Phase

- How can you use the 100-Grids to help you solve the problem?
  Responses may vary. Possible response: I can use the 100-grid to help me picture 1% of the box of candy. I can use this to help me find fractional percents.
- How many candies are in 10% of the box? How do you know?
  Responses may vary.
  Almond Delights: 80
  Chocolate Smackers: 50
  Peanut Mounds: 40
  Coconut Clusters: 60
- How many candies are in 1% of the box? How do you know?
  Responses may vary.
  Almond Delights: 8
  Chocolate Smackers: 5
  Peanut Mounds: 4
  Coconut Clusters: 6
- How many candies are in $\frac{1}{4}$% of the box? How do you know?

  Responses may vary.
- What is the relationship between 1% and $\frac{1}{4}$%?

  If you divide 1% by 4 you get $\frac{1}{4}$%.
- If you know $\frac{1}{4}$% of the box, what can you do to find $\frac{3}{4}$% of the box?

  Multiply by 3.

Evaluate

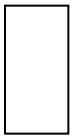
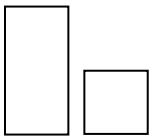
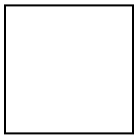
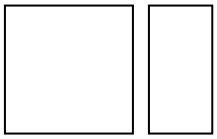
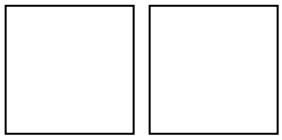
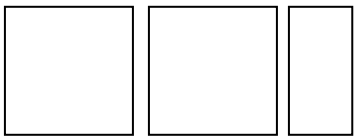
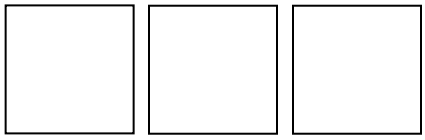
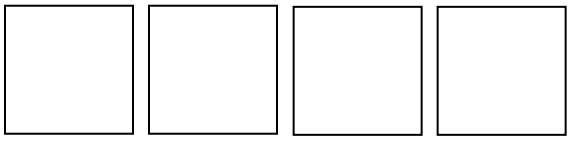
The Evaluate portion of the lesson provides the student with an opportunity to demonstrate his or her understanding of the TEKS addressed in the lesson.

1. Provide each student with **Chocolate Milk** and the selected response items.
2. Upon completion of the activity sheet, a rubric should be used to assess student understanding of the concepts addressed in the lesson.

Answers and Error Analysis for selected response questions:

Question Number	TEKS	Correct Answer	Conceptual Error	Conceptual Error	Procedural Error	Procedural Error	Guess
1	8.15A	D	A	B			C
2	8.1B	C	A	B			D
3	8.15A	A	B	C			D
4	8.2B	C	A	B			D

Candy Capers Part 1 (Answer Key)

Percent	Model	Number of Candies
25%		*2*
50%		*4*
75%		*6*
100%		**8**
150%		*12*
200%		*16*
250%		*20*
300%		*24*
400%		*32*

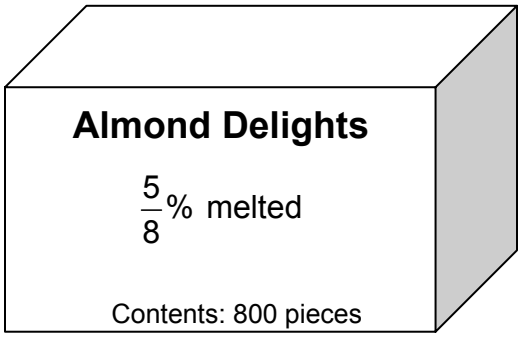
Candy Capers Part 2 (Answer Key)

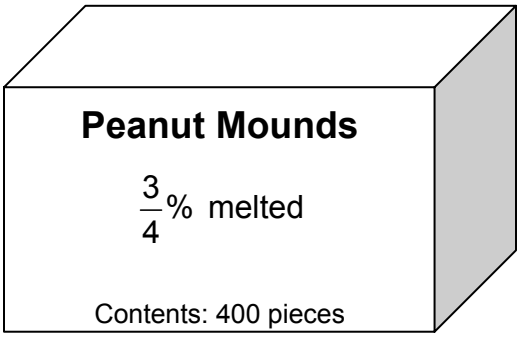
A large bag of candy at Samco Warehouse Club has 800 pieces of candy in it. Work with your group to complete the table below.

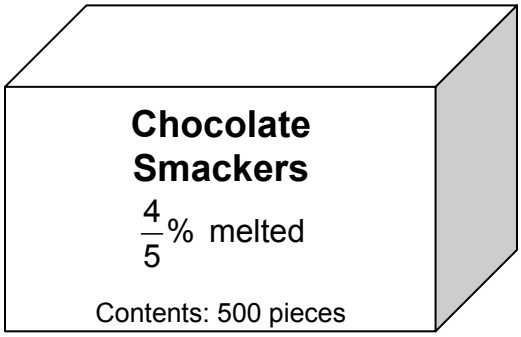
Number of pieces of candy in the original bag	**The new bag of candy is ____% of the original bag**	**Number of pieces of candy in the new bag**	**$\frac{\text{pieces in new bag}}{\text{pieces in original bag}}$**
800	500%	*4,000*	$\frac{4000}{800}=\frac{5}{1}$
800	225%	*1,800*	$\frac{1800}{800}=\frac{9}{4}=2\frac{1}{4}$
800	200%	*1,600*	$\frac{1600}{800}=\frac{2}{1}$
800	150%	*1,200*	$\frac{1200}{800}=\frac{3}{2}=1\frac{1}{2}$
800	**100%**	**800**	$\mathbf{\frac{800}{800}=\frac{1}{1}}$
800	50%	*400*	$\frac{400}{800}=\frac{1}{2}$
800	10%	*80*	$\frac{80}{800}=\frac{1}{10}$
800	1%	*8*	$\frac{8}{800}=\frac{1}{100}$
800	$\frac{1}{2}\%$	*4*	$\frac{4}{800}=\frac{1}{200}$
800	$\frac{1}{4}\%$	*2*	$\frac{2}{800}=\frac{1}{400}$

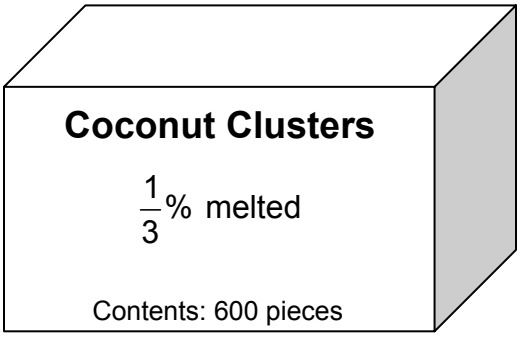
What a Mess! (Answer Key)

Several boxes of candy were left in a car on a hot Texas afternoon. Some of the candy in each box melted. Based on the information provided, order the boxes of candy from the least number of pieces melted to the greatest number or pieces melted.









Answer:
Coconut Clusters (2 melted), Peanut Mounds (3 melted),
Chocolate Smackers (4 melted), Almond Delights (5 melted)

Chocolate Milk (Answer Key)

The small size carton of Skippy Chocolate Milk contains 12 fluid ounces. The large size carton of Skippy Chocolate Milk contains 150% of the amount of milk in the small size. For a limited time, specially-marked cartons of large chocolate milk contain 25% more milk than the regular large size. How many ounces of milk are in the specially marked cartons?

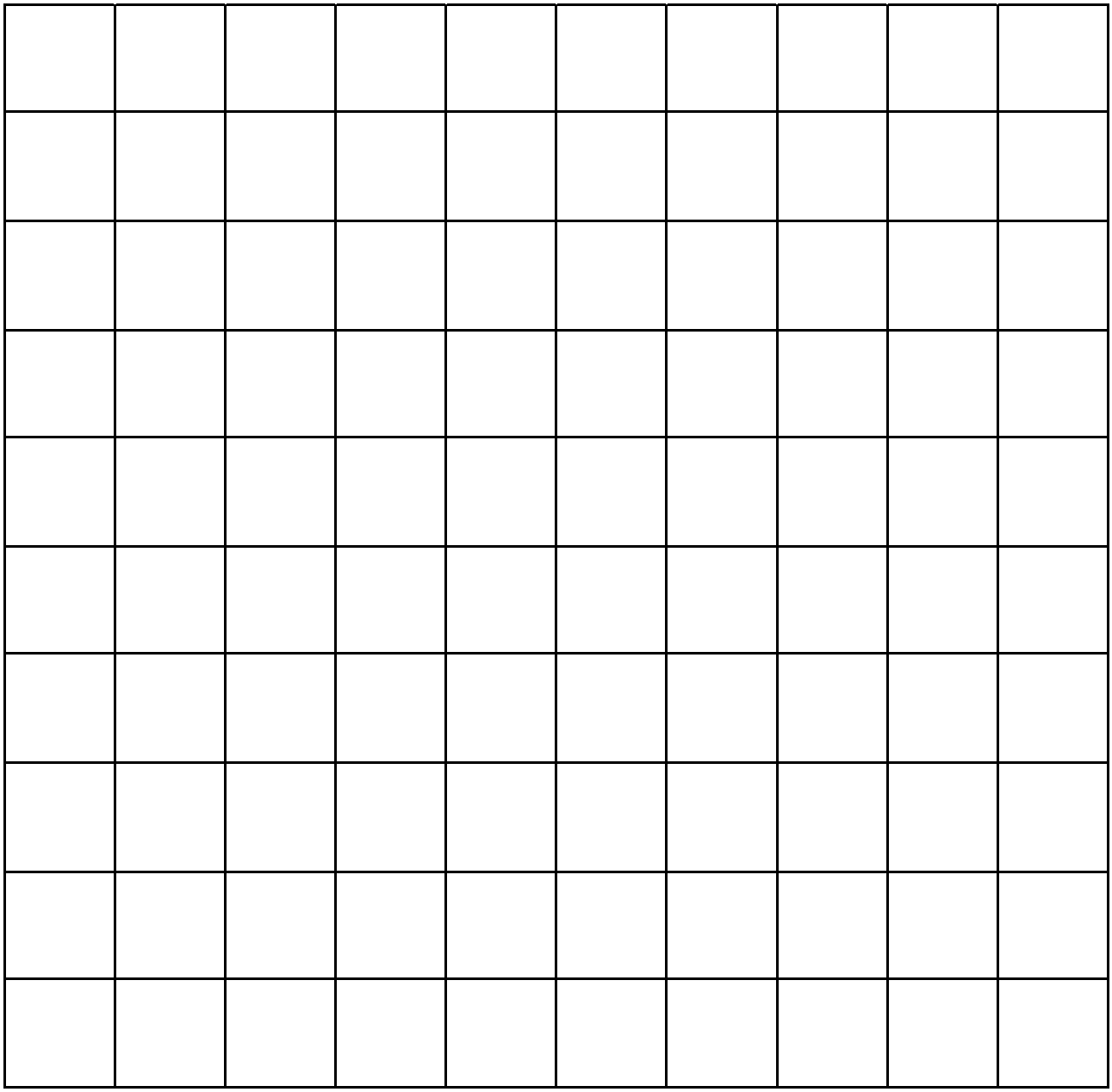
Answer: 22.5 fluid ounces.

Candy Cards

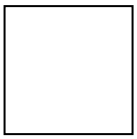
Cut along dotted lines.

A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 200% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.	A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 50% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.
A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 250% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.	A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 25% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.
A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 75% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.	A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 150% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.
A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 300% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.	A bag of 8 pieces of candy is represented by one tile. If this represents 100% of your candy, what could you use to represent 400% of your candy? How many pieces of candy will this be? Record this on **Candy Capers**.

Transparency: 100-Grid



Candy Capers Part 1

Percent	Model	Number of Candies
25%		
50%		
75%		
100%		8
150%		
200%		
250%		
300%		
400%		

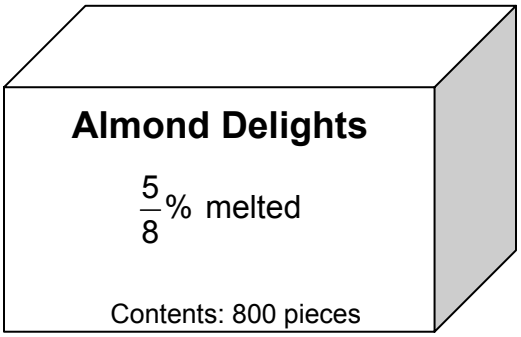
Candy Capers Part 2

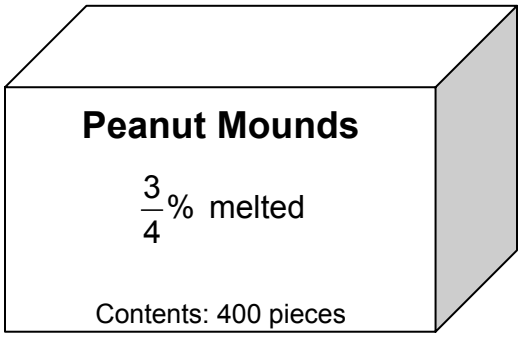
A large bag of candy at Samco Warehouse Club has 800 pieces of candy in it. Work with your group to complete the table below.

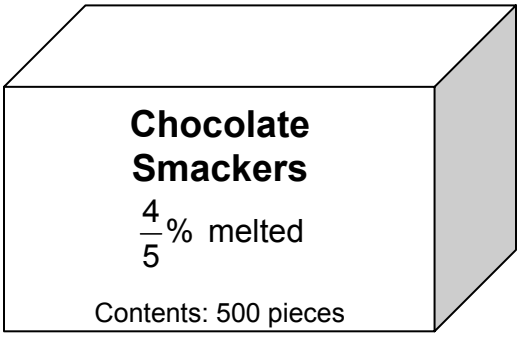
Number of pieces of candy in the original bag	**The new bag of candy is ____% of the original bag**	**Number of pieces of candy in the new bag**	**$\frac{\text{pieces in new bag}}{\text{pieces in original bag}}$**
800	500%		
800	225%		
800	200%		
800	150%		
800	**100%**	**800**	$\mathbf{\frac{800}{800} = 1}$
800	50%		
800	10%		
800	1%		
800	$\frac{1}{2}\%$		
800	$\frac{1}{4}\%$		

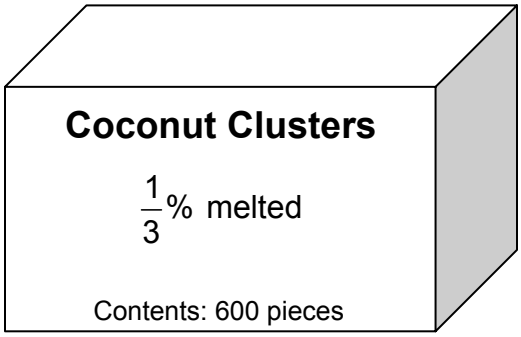
What a Mess!

Several boxes of candy were left in a car on a hot Texas afternoon. Some of the candy in each box melted. Based on the information provided, order the boxes of candy from the least number of pieces melted to the greatest number or pieces melted.

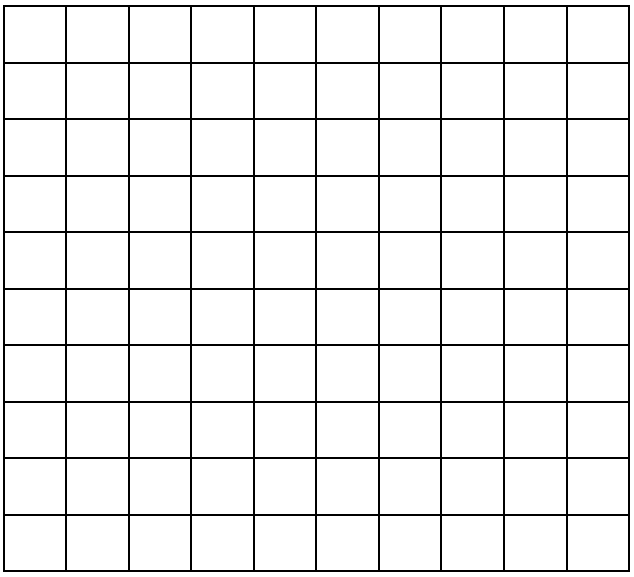


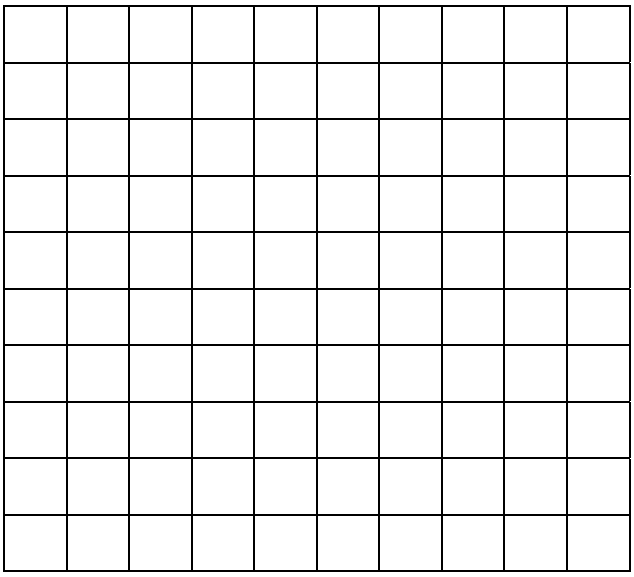


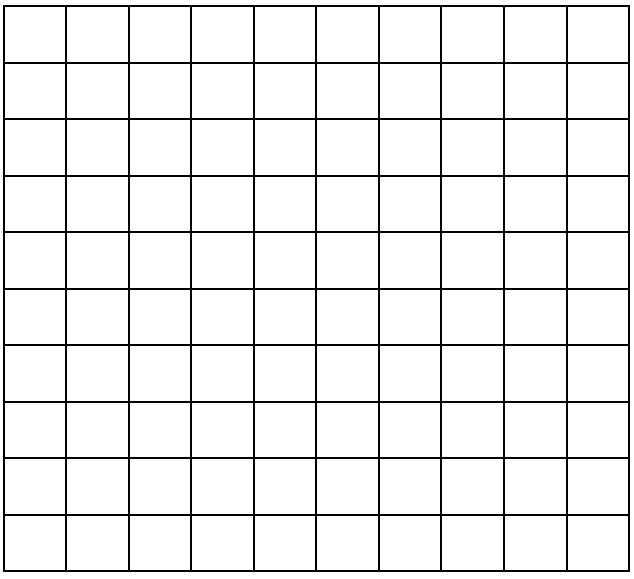


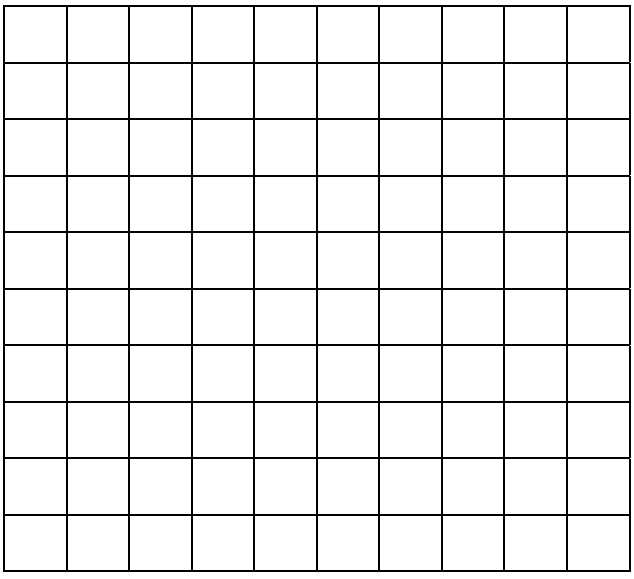


100-Grids





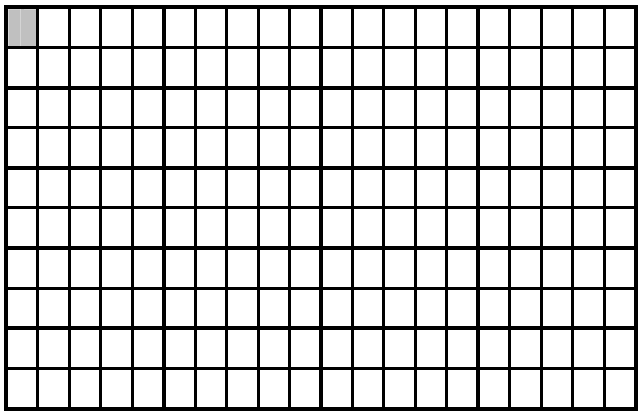




Chocolate Milk

The small size carton of Skippy Chocolate Milk contains 12 fluid ounces. The large size carton of Skippy Chocolate Milk contains 150% of the amount of milk in the small size. For a limited time, specially-marked cartons of large chocolate milk contain 25% more milk than the regular large size. How many ounces of milk are in the specially marked cartons?

1 What percent is represented by the shaded area of the model shown below?



A $\frac{1}{20}\%$

B $\frac{1}{10}\%$

C $\frac{1}{5}\%$

D $\frac{1}{2}\%$

---

2 Which of the following is NOT equivalent to $\frac{3}{4}\%$?

A 0.0075

B $\frac{3}{400}$

C 0.75

D $\frac{\frac{3}{4}}{100}$

3 A clothing store increases the original price of each garment it sells by 250%. How would the new price be calculated?

A Multiply the original price by 2.50

B Multiply the original price by 25

C Multiply the original price by 0.25

D Multiply the original price by 250

4 A silver necklace was purchased for $120 and sold at an auction for $180. What percent of $120 is $180?

A 50%

B 120%

C 150%

D 180%

Fraction Folds

TEKS

8.2A Number, operations, and quantitative reasoning. The student selects and uses appropriate operations to solve problems and justify solutions. The student is expected to select appropriate operations to solve problems involving rational numbers and justify the selections.

8.2B Number, operations, and quantitative reasoning. The student selects and uses appropriate operations to solve problems and justify solutions. The student is expected to use appropriate operations to solve problems involving rational numbers in problem situations.

8.2C Number, operations, and quantitative reasoning. The student selects and uses appropriate operations to solve problems and justify solutions. The student is expected to evaluate a solution for reasonableness.

8.15A Underlying processes and mathematical tools. The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. The student is expected to communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

8.16A Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to make conjectures from patterns or sets of examples and nonexamples.

8.16B Underlying processes and mathematical tools. The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to validate his/her conclusions using mathematical properties and relationships.

Materials

Advance preparation:

- **Transparency: Birthday Money**
- **Transparency: Allowance**

For each group of 3 - 4 students:

- White paper (for folding) – 8 to 10 sheets
- Chart paper
- Markers

For each student:

- **Birthday Money**
- **Tuesday Night Pizza**
- **Two Large!** and selected response items

Engage

The Engage portion of the lesson is designed to generate student interest in the concepts addressed and make connections to past and present learning. This part of the lesson is designed for groups of three to four students.

1. Distribute **Birthday Money** to each group of students.
2. Display **Transparency: Birthday Money** and prompt the students to work the problem.
3. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Engage Phase

- How could you show me $\frac{1}{2}$ of the birthday money?
  Responses may vary. Possible response: I could fold the sheet of paper in half.
- If she spent $\frac{1}{2}$ of the birthday money at the movies, how much did she spend? How do you know?
  $6.00 or 50%
- What percent of the birthday money does she have left? How do you know?
  50%
- How much of the certificate is left over? How do you know?
  $\frac{2}{6}$ *or* $\frac{1}{3}$
- What percent did she save? How do you know?
  $33\frac{1}{3}\%$
- Is there another way we could have drawn the birthday money model? If so, how?
  Responses may vary. Possible response: The money could have been modeled in groups of $2 instead of single dollars.

Explore

The Explore portion of the lesson provides the student with an opportunity to be actively involved in the exploration of the mathematical concepts addressed. This part of the lesson is designed for groups of three to four students.

1. Distribute 3 to 5 sheets of white paper to each group of students and **Tuesday Night Pizza** to each student.
2. Prompt students to complete **Tuesday Night Pizza.**
3. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Explore Phase

- How is the fraction represented in your paper folding?
  Responses may vary. Possible response: The fraction is represented with vertical folds in which the number of folds depends on the denominator of the fraction and the shading represents the numerator.
- How do you know how many sections in which to fold your paper for the fraction?
  Responses may vary. Possible response: by the denominator of the fraction
- How do you know how many sections to shade?
  Responses may vary. Possible response: by the numerator of the fraction
- How do you know how many sections in which to fold your paper for the percent?
  Responses may vary. Possible response: by representing 100% with ten partitions representing 10% each.
- How do you know how many sections to shade?
  Responses may vary. Possible response: by the percent. For example, if it is 40%, I shaded 4 sections where each section represents 10%.
- Where do you see the solution in paper folding?
  Responses may vary. Possible response: the area that is shaded twice

Explain

The Explain portion of the lesson is directed by the teacher to allow the students to formalize their understanding of the TEKS addressed in the lesson.

1. Debrief **Tuesday Night Pizza**.
2. Use the Facilitation Questions to lead the discussion.

Facilitation Questions – Explain Phase

- How did you represent the fraction in your paper folding?
  Responses may vary. Possible response: The fraction is represented with vertical or horizontal folds in which the number of folds depends on the denominator of the fraction.
- How did you represent the percent in your paper folding?
  Responses may vary. Possible response: The percent is represented with vertical or horizontal folds in which the number of folds is 10 for each 10%.
- What numerical representation could be used? Why?
  Responses may vary. (See key for Tuesday Night Pizza.)
- Is there a different numerical representation that could be used? If so, what is it?
  Yes (See key for Tuesday Night Pizza.)
- Where is your solution found in your model?
  Responses may vary. Possible response: the area that is shaded twice

Facilitation Questions – Explain Phase (continued)

- What relationship do you see between the numerical representation and your solution?
  Responses may vary. Possible response: If I were to multiply the numerators together and the denominators together, I would get a fraction that could be simplified to my solution.
- How could you solve the problem without the paper folding?
  Responses may vary. Possible response: I could multiply the numerators together and the denominators together, and then simplify the resulting fraction.

Elaborate

The Elaborate portion of the lesson provides an opportunity for the student to apply the concepts of the TEKS within a new situation. This part of the lesson is designed for groups of three to four students.

1. Distribute chart paper, and markers to each group of students.
2. Display **Transparency: Allowance**.
3. Prompt the students to work together to solve the problem and record their solution process on chart paper.
4. The teacher should be actively monitoring student work and asking Facilitation Questions when appropriate.

Facilitation Questions – Elaborate Phase

- What are you asked to find?
  How much money Jonathan received for his allowance.
- What information are you given?
  Twenty percent of the allowance went to a magazine; $\frac{1}{2}$ *of the allowance went for food; the rest of the allowance was split between 2 friends, and each friend received $6.00.*
- How could you create a paper model of the situation?
  Responses may vary. Possible response: I could let a sheet of paper represent Jonathan's allowance, and then partition the paper based on the given information.
- Is your answer reasonable?
  Responses may vary.
- How much did Jonathan receive?
  $30

Evaluate

The Evaluate portion of the lesson provides the student with an opportunity to demonstrate his or her understanding of the TEKS addressed in the lesson.

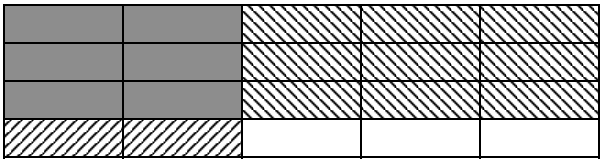
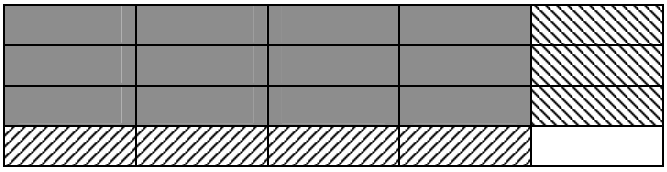
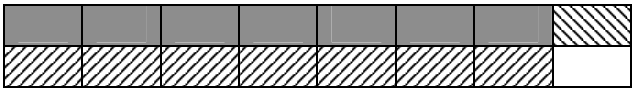
1. Provide each student with **Two Large!**.
2. Upon students' completion of the activity, a rubric should be used to assess student understanding of the concepts addressed in the lesson.

Answers and Error Analysis for selected response questions:

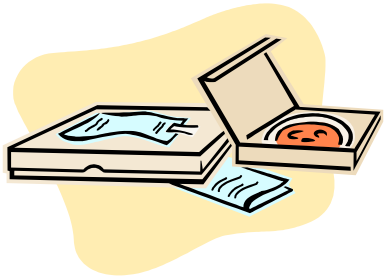
Question Number	TEKS	Correct Answer	Conceptual Error	Conceptual Error	Procedural Error	Procedural Error	Guess
1	8.2B	D	B	C			A
2	8.2B	A	B	C			D
3	8.2B	B	A	C			D
4	8.2B	C	A	B			D

Tuesday Night Pizza (Answer Key)

Use paper models to model each problem and find the solution.

<table>
<tr><td rowspan="3">40% of a pizza was covered with jalapeños. If Stacy ate $\frac{3}{4}$ of the jalapeño slices, what fraction of a whole pizza did she eat?</td><td colspan="2">Pictorial Representation
  </td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td>$\frac{3}{4}\times\frac{2}{5}$ or $\frac{3}{4}\times 0.4$</td><td>$\frac{3}{10}$ or 0.3</td></tr>
<tr><td rowspan="3">One pizza pan had $\frac{4}{5}$ of a pepperoni pizza left in it. Josue ate 75% of the pizza left in the pan. What fraction of a whole pizza did Josue eat?</td><td colspan="2">Pictorial Representation
  </td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td>$\frac{3}{4}\times\frac{4}{5}$ or $0.75\times\frac{4}{5}$</td><td>$\frac{3}{5}$ or 0.6</td></tr>
<tr><td rowspan="3">There was $\frac{7}{8}$ of a pizza left after the party. John's father ate 50% of the leftovers for a midnight snack. What fraction of a whole pizza did John's father eat?</td><td colspan="2">Pictorial Representation
  </td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td>$\frac{1}{2}\times\frac{7}{8}$ or $0.5\times\frac{7}{8}$</td><td>$\frac{7}{16}$</td></tr>
</table>

Two Large! (Answer Key)



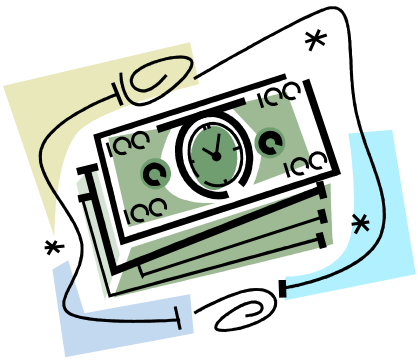
Sara bought 2 large pizzas. 40% of the 2 pizzas were covered with black olives. If Sara ate $\frac{2}{5}$ of the black olive slices, what fraction of the 2 pizzas did she eat? Justify your answer.

$\frac{4}{25}$ or 0.16

Transparency – Birthday Money

Karen received a $12.00 birthday gift certificate. She spent $\frac{1}{2}$ of it at the movies, $2.00 of it on a king-sized candy bar, and put the rest in her savings. What percent of the $12.00 gift certificate did Karen save? Use Birthday Money to demonstrate your answer.

Transparency – Allowance



Jonathan spent 20% of his allowance on a magazine. Of what was left, he spent $\frac{1}{2}$ at a fast food restaurant, and then split the remaining money evenly between 2 of his friends. Each friend received $6.00. How much money did Jonathan receive for his allowance? Justify your answer.

Birthday Money

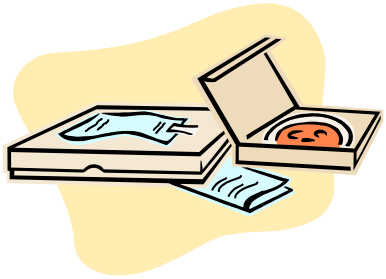
one dollar $1	one dollar $1	one dollar $1	one dollar $1	one dollar $1	one dollar $1
one dollar $1	one dollar $1	one dollar $1	one dollar $1	one dollar $1	one dollar $1

Tuesday Night Pizza

Use paper models to model each problem and find the solution.

<table>
<tr><td rowspan="3">40% of a pizza was covered with jalapeños. If Stacy ate $\frac{3}{4}$ of the jalapeño slices, what fraction of a whole pizza did she eat?</td><td colspan="2">Pictorial Representation</td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="3">One pizza pan had $\frac{4}{5}$ of a pepperoni pizza left in it. Josue ate 75% of the pizza left in the pan. What fraction of a whole pizza did Josue eat?</td><td colspan="2">Pictorial Representation</td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="3">There was $\frac{7}{8}$ of a pizza left after the party. John's father ate 50% of the leftovers for a midnight snack. What fraction of a whole pizza did John's father eat?</td><td colspan="2">Pictorial Representation</td></tr>
<tr><td>Numerical Representation</td><td>Solution</td></tr>
<tr><td></td><td></td></tr>
</table>

Two Large!



Sara bought 2 large pizzas. 40% of the 2 pizzas were covered with black olives. If Sara ate $\frac{2}{5}$ of the black olive slices, what fraction of the 2 pizzas did she eat? Justify your answer.

1 An ice chest contains 8 soft drinks. Five of the soft drinks are lemon-lime flavored. 40% of the lemon-lime soft drinks are in bottles. What fraction of the soft drinks in the ice chest are bottles of lemon-lime?

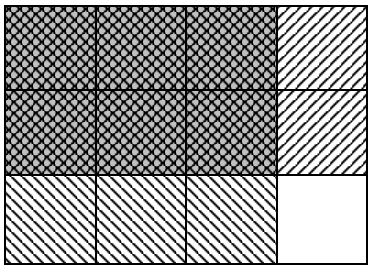
A $\frac{4}{5}$

B $\frac{5}{8}$

C $\frac{2}{5}$

D $\frac{1}{4}$

2 What expression is modeled below?



A $75\% \times \frac{2}{3}$

B $75\% \times \frac{3}{4}$

C $50\% \times \frac{3}{4}$

D $66\frac{2}{3}\% \times \frac{2}{3}$

3 In Mrs. Johnson's homeroom, $\frac{4}{5}$ of the students are in the band. Of those in the band, 25% play the flute. What fraction of the class plays the flute for the school band?

A $\frac{1}{4}$

B $\frac{1}{5}$

C $\frac{1}{2}$

D $\frac{1}{10}$

4 Half of the vehicles in the parking lot are trucks. Of those, 80% are red. What fraction of the vehicles in the parking lot are red trucks?

A $\frac{4}{5}$

B $\frac{1}{2}$

C $\frac{2}{5}$

D $\frac{1}{10}$

Paper Rulers